PAN Germany

Pesticide Use Reporting

Legal Framework, Data Processing and Utilisation

Part One: Full Reporting Systems in California and Oregon

Hamburg, January 2002

Pesticide Action Network

Founded in 1982, Pesticide Action Network is an international coalition of over 400 citizen groups in more than 60 countries working to oppose the misuse of pesticides and to promote sustainable agriculture and ecologically sound pest management.

PAN Germany was founded in 1984 and strives to reduce impacts of pesticide use on national, european and international level.

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Table of Contents

List of Tables

List of Figures

List of Maps

List of Acronyms

ABR	Air Resources Board
BIOS	Biologically Integrated Orchard System
CA	California
CAC	County Agricultural Commissioner
CAS	Chemical Abstract Registry Number
CAWG	California Association of Winegrape Growers
CEDTS	California Electronic Data Transfer System
DPR	Department of Pesticide Regulation
EPA	Environmental Protection Agency
EU	European Union
FQPA	Food Quality Protection Act
GIS	Geographic Information System
GPS	Geographic Positioning System
ID	Identification Data
IPM	IPM Integrated Pest Management
MOE	margins of exposure
MTRS	Meridian, Township, Range, Section
NAWQA	National Water-Quality Assessment
ODA	Oregon Department of Agriculture
OP	Organophosphates
OPP	Office of Pesticide Programmes
OR	Oregon
ORA	Oregon Administrative Rules
PAN	Pesticide Action Network
PANNA	Pesticide Action Network North America
PUR	Pesticide Use Reporting
ROG	reactive organic gas emissions
SAREP	Sustainable Agriculture Research and Education Program
UC	University of California
VOC	Volatile Organic Compound
ZIP	Zone Improvement Plan (US postal code)

1 Introduction

Pesticides have been used on a larger scale in the world for over 50 years. They are mostly being used in agriculture, forestry, nurseries, tree-nurseries, urban settings, as wood preservatives, for food storage, on rail-road tracks and rights of way, and privately for home and garden use. Some of the pesticides used are highly acute toxic to humans and some of them present a more subtle long term threat of cancer or other chronic diseases.

In spite of the fact that pesticides are among the more toxic substances released into the environment, surprisingly little public information is available about the details of their distribution and use patterns.

Pesticide Use Reporting (PUR) Systems - systems in which the applicator is legally bound to report the pesticide use to a governmental organisation are established in very few countries. Most countries which track pesticide use conduct farmer surveys and/ or collect sales data. In some countries farmers need to keep records of their use.

Table 1 presents the tracking systems in the Member States of the European Union. Only the United Kingdom maintains some kind of pesticide use reporting.

Table 1: Overview of Agricultural Pesticide Use Tracking Systems in the 15 EU Member States

Member State	Collection of Sales Data	Pesticide Surveys	Mandatory Record Keeping	Pesticide Use Reporting
Austria	volume active ingredients	not regular	no	no
Belgium	volume formulated products	3-4 crops per year	for apples, pears and glass house crops	no
Denmark	monetary value and volume formulated products and active ingredients	no	yes	no
Finland	monetary value and volume formulated products and active ingredients (obligatory reporting)	no	no	no
France	yes	no	no	no
Germany	volume active ingredients	no	no	no
Greece	volume formulated products	no	no	no
Ireland	volume active ingredients	no	no	no
Italy	yes	no	no	no
Luxembourg	yes	no	no	no
Portugal	monetary value and volume active ingredients	no	no	no
Spain	yes	no	no	no
Sweden	monetary value and volume formulated products	no	yes	no
The Netherlands	volume formulated products and active ingredients	monthly 1 crop	yes	no
United Kingdom	monetary value	yes	yes	for aerial applications

Sources: Interviews with responsible institutions in the EU Member States.

Information such as the amount and identity of pesticides applied at a particular location on a certain date can be enormously useful both in the protection of human and environmental health and in pest management. With increasing concern over the adverse impacts of pesticides on the environment and public health, accurate information on pesticide use can help provide better risk assessments and illuminate pest management practices that are particularly problematic so they may be targeted for development of alternatives.

This report presents two examples of existing full reporting systems in the U.S. States, California and Oregon. The PUR system of California is the oldest established full reporting system in the world the Oregon PUR system was initiated in 1999 with full reporting beginning January 2002. Both systems have a considerably different reporting structure. In order to illustrate the immense advantage of pesticide use data, a major focus of this report is the presentation of the utilisation of pesticide use data.

This report is part of the PAN Germany project: Development of a Pesticide Use Reporting System in the European Union. This project aims at the establishment of a PUR system in the European Union. The first report presents existing full reporting PUR systems in California and Oregon and build the foundation for a model of how a PUR system in the EU could work.

2 California‘s Pesticide Use Reporting System

“California's pesticide regulatory program is considered by many to be a model program, and its pesticide use reporting program is recognized as the most comprehensive in the world.”[1]

Pesticide use reporting has a long history in California. Already in 1967, the legislature adopted a statute requiring commercial pest control operators to keep specific pesticide use records. From 1972 through 1990, commercial pest control operators had to file each pesticide application as written reports with the County Agricultural Commissioner (CAC). Farmers who applied restricted use pesticides were required to file use reports within 7 days after application. All reported data were forwarded from the counties to the state. In 1986 the study ‘The Delaney Paradox’ by the National Research Council was published. The study estimated the theoretical health impact of food residues based on the assumption that all crops were treated with 100 percent of the pesticides that were registered for use on those crops, at the maximum label rate, and with the minimum pre-harvest interval. These worst-case results raised major concerns among the public and the agricultural community. The request for real use statistics led to the introduction and implementation of full reporting in California in 1990.[2] The legal act for the pesticide use reporting is the California Food and Agriculture Code. In Section 12979 is written:

“A pesticide use report shall be submitted to the commissioner or director on a form and in a manner prescribed by the director. The data from the pesticide use reports shall be considered in setting priorities for food monitoring, pesticide use enforcement, farm worker safety programs, environmental monitoring, pest control research, public health monitoring and research, and similar activities by the department, or by the department in cooperation with other state, regional, or local agencies with appropriate authority.”[3]

In the California Code of Regulations sections 6624, 6626 and 6627 the details and the extent of the full reporting system are described:[4]

“6624. Pesticide Use Records

(a) The following persons shall maintain records of pesticide use:

(1) Any person who uses a pesticide for an agricultural use as defined in Food and Agricultural Code Section 11408, other than use on livestock as defined in Food and Agricultural Code Section 18663;

(2) Any person who uses a pesticide listed in Section 6400;[5]

(3) Any person engaged for hire in the business of pest control;

(4) Any person who uses a pesticide for industrial post-harvest commodity treatment; and

(5) Any person who uses a pesticide listed in Section 6800(b) for any outdoor institution or outdoor industrial use.

(b) The records shall include the following information for each pest control operation:

1 California Environmental Protection Agency, Department of Pesticide Regulation, (2000): Pesticide Use Reporting, An Overview of California’s Unique Full Reporting System, Sacramento, USA

2 personal communication with Ms. Scott, Department of Pesticide Regulation

3 California Food and Agriculture Code, Section 12979

4 California Code of Regulations, Title 3.Food and Agriculture, Division 6. Pesticides and Pest Control Operations, Chapter 3. Pest Control Operations, Subchapter 2. Work Requirements, Article 1. Pest Control Operations Generally, Sections 6624, 6626, 6627

5 restricted use pesticides

(1) Date of application;
(2) Name of the operator of the property treated;
(3) Location of property treated;
(4) Crop commodity, or site treated;
(5) Total acreage or units treated at the site; and
(6) Pesticide, including the United States Environmental Protection Agency (U.S. EPA) or State registration number which is on the pesticide label, and amount used.

(c) In addition to the information required in subsection (b), the operator of the property which is producing an agricultural commodity, and an agricultural pest control business applying pesticides to such property, shall include in the records the following information for each pest control operation:

(1) Location of the property treated, by county, Section, Township, Range, Base and Meridian;
(2) Hour the treatment was completed;
(3) The operator identification number issued to the operator of the property treated;
(4) The site identification number issued to the operator of the property treated;
(5) Total acreage (planted) or units at the site; and
(6) Name or identity of the person(s) who made and supervised the application, if the pesticide application was made by an agricultural pest control business.

(d) The operator of the property which is producing an agricultural commodity shall maintain records of pesticides applied by an agricultural pest control business to such property, by site.

(e) In addition to the information required in (b), effective January 1, 2002, persons engaged for hire in the business of pest control at a school site [defined in Education Code section 17609(e)] shall include in the records the following information for each pest control operation:

(1) Time application was completed;

(2) Name and address of the school site; and

(3) Application location at the school site. For purposes of this subsection, location includes, but is not limited to, classrooms, playgrounds, cafeteria, vehicles, and athletic fields.[6]

(f) The records required pursuant to this section shall be retained for two years and made promptly available to the director or commissioner upon request.

6626. Pesticide Use Reports for Production Agriculture

(a) The operator of the property which is producing an agricultural commodity shall report the use of pesticides applied to the crop, commodity, or site to the commissioner of the county in which the pest control was performed. This report shall be hand-delivered or mailed, by the 10th day of the month following the month in which the work was performed. This report is not required if the pesticide use is reported to the commissioner by an agricultural pest control business as specified in subsection (b); however, the operator of the property treated, shall retain a copy of the business "Report by Site" for two years.

6 (e) Amended by Healthy Schools Act of 2000: Pesticide Use Reporting and Record keeping (Approved 10/11/01; Effective 11/10/01), Title 3. California Code Of Regulations, Chapter 3. Pest Control Operations Subchapter 2. Work Requirements Article 1. Pest Control Operations Generally

(b) An agricultural pest control business shall report the use of pesticides applied by it for the production of an agricultural commodity to the commissioner of the county in which the pest control was performed, by hand-delivery or by mail, within seven days of completion of the pesticide application. A copy of the report shall be sent by the business to the operator of the property where the pest control was done within 30 days of completion of the pesticide application.

(c) Each report of pesticide use pursuant to this Section shall be on a department form or in a format approved by the director. Acceptable department forms include form 38-017 for an operator of the property to report pursuant to subsection (a), and 39-025 for an agricultural pest control business to report pursuant to subsection (b). The information to be reported shall include the information specified in Section 6624, and the name and address of the agricultural pest control business which made the application, if such a business made the application.

(d) If the report is mailed, the postmark shall be the date of delivery.

(e) If the county in which work was performed has no commissioner, the report shall be made to the director.

6627. Monthly Summary Pesticide Use Reports

(a) Except as provided in Section 6626, persons required to maintain pesticide use records pursuant to Section 6624 shall report a summary of the monthly use of pesticides to the commissioner of the county in which the work was performed. The report shall be provided to the commissioner by the 10th day of the month following the month in which the work was performed. If the report is mailed, the postmark shall be the date of delivery.

(b) The report shall be on a department form as specified in Section 6627.1 or in a format approved by the director. The report shall include the following:

(1) The name and address of the person who or business/organization which applied the pesticide(s);

(2) County where the pest control was performed;

(3) Month and year of pesticide use;

(4) Crop, commodity or site treated, except when using a designated use code, as specified on the Monthly Summary Pesticide Use Report form;

(5) Pesticide, including the United Stated Environmental Protection Agency or State registration number which is on the pesticide label, and the amount used;

(6) Number of applications made with each pesticide and the total number of applications made during the month; and

(7) Total acres or units treated with each pesticide, except when using a designated use code, as specified on Summary Pesticide Use Report form.

(c) If the county in which the work was performed has no commissioner, the report shall be made to the director."[7]

Exceptions to full use reporting are home and garden applications, and most industrial and institutional uses. All uses of pesticide products containing active ingredients listed in the Groundwater Protection List have to be reported as well, excluded are home and garden applications.[8]

7 ibid. 4

8 Title 3. California Code Of Regulations Chapter 4. Environmental Protection Subchapter 1. Groundwater Article 1. Pesticide Contamination Prevention

2. 1 Pesticide Use in California

Sincefull reporting started in 1990, information on pesticide use by crop, location, pesticide product, active ingredient, month and year is publicly available. The newest data available are from 2000. The total reported pesticide use in 2000 was 84.967.821 kg active ingredients. Table 2 shows that the highest pesticide use occurs in agricultural production.[9]

Table 2: Reported Pesticide Use in California by Category 1995 - 2000 in Kilograms

Category	1995	1996	1997	1989	1999	2000
Production agriculture	85.069.352	82.709.918	86.075.339	89.951.757	84.433.290	77.982.011
Post harvest fumigation	1.709.827	838.031	729.703	750.111	860.877	967.025
Structural pest control	2.194.725	2.148.829	2.351.431	2.686.738	2.429.695	2.339.674
Landscape maintenance	627.013	571.126	558.634	636.606	601.441	632.126
Other applications[a]	3.430.353	3.450.228	3.155.513	3.073.030	3.457.700	3.046.984
Total	93.031.270	89.718.132	92.870.620	97.098.242	91.783.004	84.967.821

a other applications: right-of-ways, vertebrate control, public health, fumigation of wood, furniture, and other non-food items and research applications

Source: DPR Pesticide Use Report 1999 and 2000 (1999 and 2000 are preliminary data)

On California's 11 mill. hectare farmland (cropland 4 mill. ha) a wide variety of crops are grown, the Department of Pesticide Regulation /DPR) counts more than 265 different crops and commodities.[10] Fifty percent of all fruits, nuts and vegetables produced in the U.S. are grown in California, and California is home to the second largest cotton production in the U.S.[11]

There are some 74.126 farms in California and Table 3 shows that more than 50% of the farms are smaller than 20 hectare.[12]

Table 3: Number of Farms by Farm Size in California in 1997

Farm by Size in Acre	Farm by Size in Hectare	Number of Farms
1 to 9	0,4 to 3,6	20.662
10 to 49	4,0 to 19,8	24.250
50 to 179	20,2 to 72,4	13.288
180 to 499	72,8 to 201,9	7.270
500 to 999	202,3 to 404,3	3.572
1.000 or more	404,7 or more	5.084

Source: NASS

9 Department of Pesticide Regulation, (2000): Summary of Pesticide Use Report Data 1999, Indexed by Commodity, Preliminary Data, Sacramento, USA

10 Wilhoit, L. Davidson, N., et al. (1999): Pesticide Use Analysis and Trends from 1991 to 1996, Department of Pesticide Regulation, Sacramento, USA

11 California Department for Food and Agriculture (CDFA), California Agricultural Resource Directory 1997, California Department for Food and Agriculture (CDFA), Sacramento 1997

12 U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), (2001): Agricultural Census for Oregon, Washington DC, USA

2. 2 Pesticide Use Data Collection and Data Transfer

The responsible agency for pesticide use reporting is the Department of Pesticide Regulation (DPR) within the California Environmental Protection Agency (CA EPA) in cooperation with the County Agricultural Commissioners (CAC) of the 58 counties.

2. 2. 1 Pesticide Users

Four standardised forms, one for agricultural use, one for non-agricultural use, one for pesticide use in schools, and one for use of restricted materials have been developed for the pesticide use reports. The pesticide applicators must fill out and submit the form to the agricultural commissioner of the county in which the application was conducted. There are two exceptions, the California Department of Transportation submits their records for pesticide use on right of ways directly to DPR. School site pesticide use reports are also submitted directly to DPR.

The forms can be found in Appendix CA 1; data elements for applications include following fields:

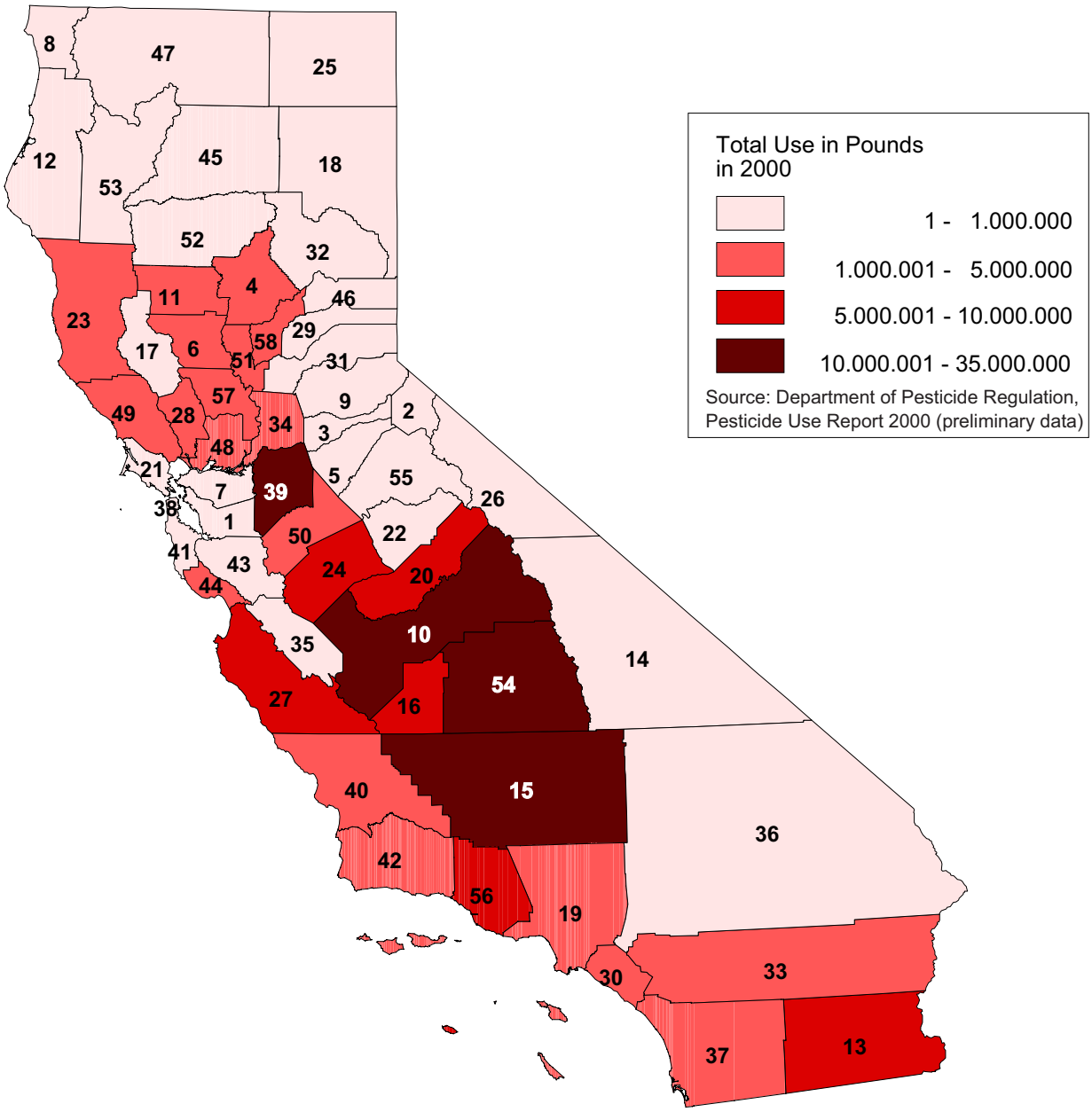
- month and year of the application(s),
- date and time of application,
- county,
- geographic location including the Meridian (base), Township, Range, Section (MTRS)
- field location,
- site ID,
- operator ID/permit number,
- operator name and address,
- applicator name and address,
- commodity/crop/site treated,
- acres or units planted,
- acres or units treated,
- application method (air, ground, other),
- U.S. EPA/California pesticide registration number of the pesticide product(s) applied,
- pesticide product(s) name and manufacturer,
- amount of product(s) applied, and
- person who prepared the report

Each single registered pesticide product used in an application, for example in tank mixes (but not the diluent), must be reported separately. For this purpose the hard copy forms contain 8 or 9 rows for non-agricultural and agricultural applications, respectively. Each reported use of a pesticide product represents a ‘record.’

The effort to report the pesticide applications varies widely; organised operators just need one to two minutes to fill out one record. According to the Monterey County Agricultural Commissioner (CAC), vegetable growers spend several hours per month on use reporting, grape and strawberry growers spend perhaps 8-12 hours a month. The Alameda CAC estimates that a grower, who is filling out the report by hand, spends 1-2 hours per month on use reporting. He also states that for most growers in Alameda county, use reports are created automatically while keeping records for their own purposes. Sometimes pest control advisers prepare use reports as part of their service. According to the Tulare County Agricultural Commissioner approximately, 10 minutes are needed to fill out one hard copy use report. [13]

13 personal communication with Mr. Edwards, Fresno CAC; Mr. Bonds, Tulare CAC; Mr. Gee, Alameda, CAC and Mr. Roach, Monterey CAC

Map 1: California Counties and Their Total Reported Pesticide Use in 2000



1	Alameda	14	Inyo	27	Monterey	40	San Luis Obispo	53	Trinity
2	Alpine	15	Kern	28	Napa	41	San Mateo	54	Tulare
3	Amador	16	Kings	29	Nevada	42	Santa Barbara	55	Tuolumne
4	Butte	17	Lake	30	Orange	43	Santa Clara	56	Ventura
5	Calaveras	18	Lassen	31	Placer	44	Santa Cruz	57	Yolo
6	Colusa	19	Los Angeles	32	Plumas	45	Shasta	58	Yuba
7	Contra Costa	20	Madera	33	Riverside	46	Sierra		
8	Del Norte	21	Marin	34	Sacramento	47	Siskiyou		
9	El Dorado	22	Mariposa	35	San Benito	48	Solano		
10	Fresno	23	Mendocino	36	San Bernardino	49	Sonoma		
11	Glenn	24	Merced	37	San Diego	50	Stanislaus		
12	Humboldt	25	Modoc	38	San Francisco	51	Sutter		
13	Imperial	26	Mono	39	San Joaquin	52	Tehama		

N

2. 2. 2 County Agricultural Commissioners (CAC)

California is made up of 58 counties (see Map 1). The agricultural commissioner in each county is also responsible for the implementation of DPR's regulatory program and the collection of pesticide use reports. The applicator delivers the pesticide use reports via hard copy or electronically (modem/ floppy disk) to the agricultural commissioners, who conduct the a first review and the first data processing step.

To encourage more electronic reporting, DPR developed the California Electronic Data Transfer System (CEDTS) which was used in 2000 by 30 counties.[14] Pesticide applicators can access a password-protected host computer located in the CAC offices and enter the pesticide use report. The entered data are validated in a two-step process, in the first step the entries are checked for correctness and completeness and the second step checks the data against the county pesticide regulatory database. Errors are corrected in cooperation with the reporting person. Data passing all validation are transferred to a use reporting database, which is finally transferred to the state office of the Department of Pesticide Regulation.

Hard copy reports are entered manually by the CAC into the database. To process a use report, county employees enter the ID number of the applicator. Matching grower data already in the database are displayed on the screen and the records are scanned until the site ID and commodity/crop combination for the treated field are displayed. Data such as the site ID, commodity code, planted acreage, and location (section, township, range, base, and meridian) are copied to the use report record; information specific to the application is then entered (date and time, treated acres, application method, U.S. EPA or California registration number, and amount of pesticide used). After a record has been entered, it is transferred to a use report database on the county's computer. Extensive validity checks of the entered data are made against the grower's data files and other data bases, such as the registered product database described below. Periodically, the use report data are downloaded to an electronic file that is then transferred to DPR's Pest Management and Licensing Branch via floppy disk or electronically via the Internet.[15]

In order to trace back potential reporting errors, the software automatically generates the Batch_No, the Document_NO, the Summary_CD, and Record_ID. These fields are created to identify later the input record in case an error occurs.

In 1997/98 DPR conducted a limited review of workload and process in 7 counties. These counties represented a cross section of agricultural practices, workload volume, and staffing to process pesticide use reports.On average, 65,33 records per hour were processed by these counties. Processing includes document review and preparation, data entry, quality control, and initial error corrections. Approximately 2.6 million records are submitted by the counties to DPR annually. In addition, 14.000 records are identified with errors once DPR has processed the data. These are returned to the counties for research and correction. In most cases, errors are due to data entry. This requires staff to locate the original use report and then to determine the source of the error and to correct the records. In a small portion, errors are in reporting. This scenario requires that after locating the original use report, the county contact the grower or applicator to obtain the correct information. DPR does not have any statistics on how long it takes counties to process errors or outliers. The counties use on from 1-5 PCs for data entry only. Fresno and Monterey counties (300.000 to 350.000 use reports annually) have dedicated

14 more information see http://www.cdpr.ca.gov/docs/county/manuals/cedtpco/cedtpc01.htm#Introduction

15 ibid. 1

data entry staff, as do other counties with higher volumes of use reports. In some counties, the workload is shared among professional staff (2 or 3 individuals) on a part-time basis. In smaller counties, only one person may be assigned the task of data entry on a part-time basis.[16]

As the next examples show, the number of reports received by the agricultural commissioner and the workload vary.

Fresno County

Fresno County is the county with the highest total pesticide use. (15.763.442 kg active ingredients in 2000).[17] The some 5000 farmers in Fresno county conduct approximately 4-6 applications per site, and an average of 26.000 records are submitted monthly to the agricultural commissioner office (includes non-agricultural use). Two full time operators enter the data into a PC, which takes approximately 30 seconds per record. The professional staff spends additional 8 hours per week to work on the erroneous records.[18]

Tulare County

Tulare County is number three in total pesticide use in California. (7.455.274 kg active ingredients in 2000). An average of 16.700 records are submitted monthly. Four staff members work approximately 1.200-1.500 hours to process the data.[19]

Monterey County

Monterey County is number six in total pesticide use in California (4.097.152 kg active ingredients in 2000). Approximately 7.600 hard copy reports are being submitted monthly which are entered by three full time operators.[20] Additionally, approximately 2.250 records are submitted electronically.

Los Angeles County

Los Angeles County is number sixteen in pesticide use (1.554.743 kg active ingredients in 2000).The CAC office receives annually about 8.400 non-agricultural use reports and approximately 6.700 agricultural pesticide use reports. This averages about 700 non-agricultural use reports and approximately 500 agricultural pesticide use reports per month. Four staff member on 4 PCs need about 5 minutes to process one report. Approximately 280 reports per year are returned for corrections. The time to correct errors varies from a few minute to hours per record.[21]

Alameda County

Alameda county is number 37 in pesticide use (168.085 kg active ingredients in 2000). The county staff receives on average 425 paper use reports per month. Two people work on two PCs 5 hours per week to process the data. The correction of erroneous records, which count usually less than 50 per month, takes approximately 15 minutes per record if the pesticide user can be contacted immediately.[22]

Periodically, the counties submit their databases for uploading into the central database to DPR's Pest Management and Licensing Branch.

16 personal communication with Ms. Scott, Information Technology Manager, DPR
17 ibid. 9
18 personal communication with Mr. Edwards, Agricultural Commission in Fresno County
19 ibid. 13
20 personal communication with Mr. Roach, Agricultural Commission in Monterey County
21 personal communication with Mr. Sokulsky, Agricultural Commission in Los Angeles County
22 ibid. 13

2. 2. 3 Department of Pesticide Regulation

After loading the data received from the CACs into the central DPR database, some 50 different validity checks are conducted. Erroneous records go back to the counties for resolution, approved records go into the main database. With the so called Outlier Program, DPR developed a statistical method to detect probable errors for the amounts used and the acres treated.

Outlier Program

The Outlier Program calculates application rates and considers them outliers if

"(1) they were higher than 200 pounds of active ingredient per acre (or greater than 1,000 pounds per acre for fumigants);

(2) they were 50 times larger than the median rate for all uses with the same pesticide product, crop treated, unit treated, and record type (that is, production agricultural or all other use); or

(3) they were higher than a value determined by a neural network procedure that approximates what a group of 12 scientists believed were obvious outliers."[23]

The entire error checking procedure removes less than one percent of the records. Outliers are flagged in the data base and return to the counties for resolution.

Using the unique U.S. EPA or California registration number and the so called Product Label Database, the amount of active ingredients in pounds are calculated.

2. 3 Product Label Database

The Product Label Database is the key database to convert the different products used, with their different formulations and active and inert ingredients, into pounds of active ingredients. Data fields in the Product Label Database include:

- U.S. EPA or California registration number;
- pesticide product name;
- type of pesticide;
- formulation;
- active ingredients;
- percent of each active ingredient;
- percent of total inert ingredient per product
- specific gravity;
- type of registration;
- all commodity/ crop/ sites on which the product may be used;
- health and environmental hazards;
- general categories of target pests; and
- application instructions.

Key information from the pesticide use reports are the U.S. EPA or California registration number as the unique common field with the Product Label Database, the amount product used, and the unit of measurement.

23 Department of Pesticide Regulation, (2000): Summary of Pesticide Use Report Data 1999, Indexed by Commodity, Preliminary Data, Sacramento, USA

2. 4 The Coding System

Most information in the PUR database is encoded to make the database smaller in size and achieve consisting labelling. The CAC determines the appropriate codes to each pesticide use record, while entering the data into a PC. The next table presents the common codes within the PUR system established in California.

Table 4: The PUR Coding System

Code	Number of Codes	Format	Number of Digits
County code	58	numeric	2
Site code (crop/ commodity)	264	numeric	2-6
Chemical code (active ingredients, adjuvants)	3.579	numeric	1-5
Formula code (formulations e.g. powder, liquid)	21	letters	2
Product number	34.266	numeric	1-5
Qualifier code (treatment method)	39	numeric	1-2

While many researchers would like to obtain information on the target pests, there will not be a code system for the target pest in the near future.[24]

2. 5 Locating Pesticide Use in California - the MTRS Grid System

With settlement of the western United States, the government conducted an extensive land survey and established a grid system based upon Meridians, Ranges, Township and Sections. The MTRS grid system is similar to an x-y coordinate system, with the meridian as y-axis, and the township baseline as x-axis. A specific location on the x-axis is defined by the Range Number, a specific location on the y-axis is defined by the Township Number. Three meridians cover the area of California: Humboldt, Mount Diablo and San Bernardino. Each meridian builds its own coordinate system with four quadrants designated Northwest (NW), Northeast (NE), Southwest (SW) and Southeast (SE) (see Map 2). All MTR blocks in the same quadrants have the same Township Direction and Range Direction. Map 2 shows an example in the area of the **S**an Bernardino meridian. The MTR Block S04S03W is located in the **S**outh-**W**est quadrant, and has therefore assigned township direction **S**outh and the range direction **W**est. The township number is 04. The next MTR block south would have the number 05, the next one North 03. The range number of the block is 03, the next MTR block west would have the number 04, the next one east 02. One MTR block comprises a square of 6 by 6 square miles. That equals 36 sections, which are numbered from 01 through 36.

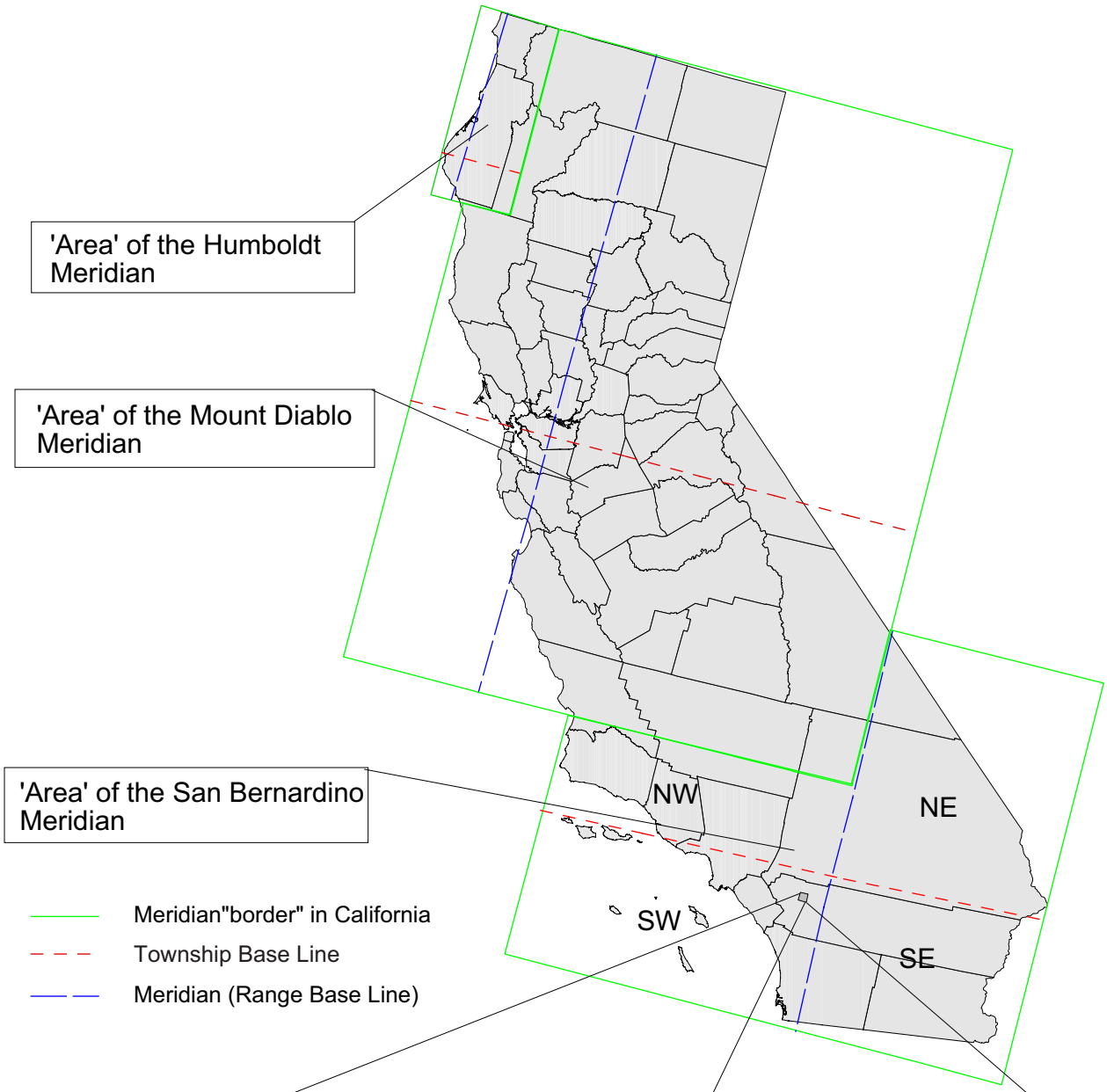
Agricultural pesticide use is reported by section, i.e. by square mile.

Since the MTRS grid system has been established for a long time, the farmers know the location of their fields within the grid. The MTRS grid system within California is presented in Map 2.

This small geographic scale of one square mile is very valuable for the evaluation of the pesticide use data and targeted monitoring (see Chapter 3 Data Utilisation).

24 personal communication with Mr. Wilhoit, DPR

Map 2: The MTRS Grid System in the Area of California



06	05	04	03	02	01
07	08	09	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36

MTR Block: S04S03W
Meridian = **S**an Bernardino
Township Number = **04**
Township Direction= **S**outh
Range Number= **03**
Range Direction = **W**est

36 Sections build
one MTR Block,
one Section comprises
one Square Mile

Albers Equal- Area Conic Projection
of the United States

2. 6 Maintenance of the PUR System

Annual cost to administer the pesticide use reporting system is approximately $1,8 million. This includes $810.000-$850.000, which are paid to the CACs for PUR data entry and error corrections. The $1,8 million dollar does not include the maintenance of the Product Label Database, since this is also used by other DPR programs. The Department of Pesticide Regulation is significantly financed by the Mill Assessment, which is the rate per dollar of sales for all sales of pesticides at the first point of sale. Currently this rate is at 17.5 mills or $0,0175.[25] In 1999 DPR operated with a budget of $52,2 million and 338 employees. Almost half of its funds, $27 million, were mill assessment revenues.[26]

DPR is using Oracle database software for its databases.

2. 7 Data Access

DPR sells the pesticide use report data for a small charge in printed or electronic form. The electronic form of pesticide use database comes on a CD-ROM which contains 58 files for the 58 counties as well as look up tables/data bases:

- a pesticide product database
- codes for crops and commodities
- codes for counties
- DPR chemical codes and the name of the active ingredient/ adjuvant and CAS number
- codes for formulations
- qualifier codes, which are used with commodities to reveal information on how to use a pesticide for a specific commodity.

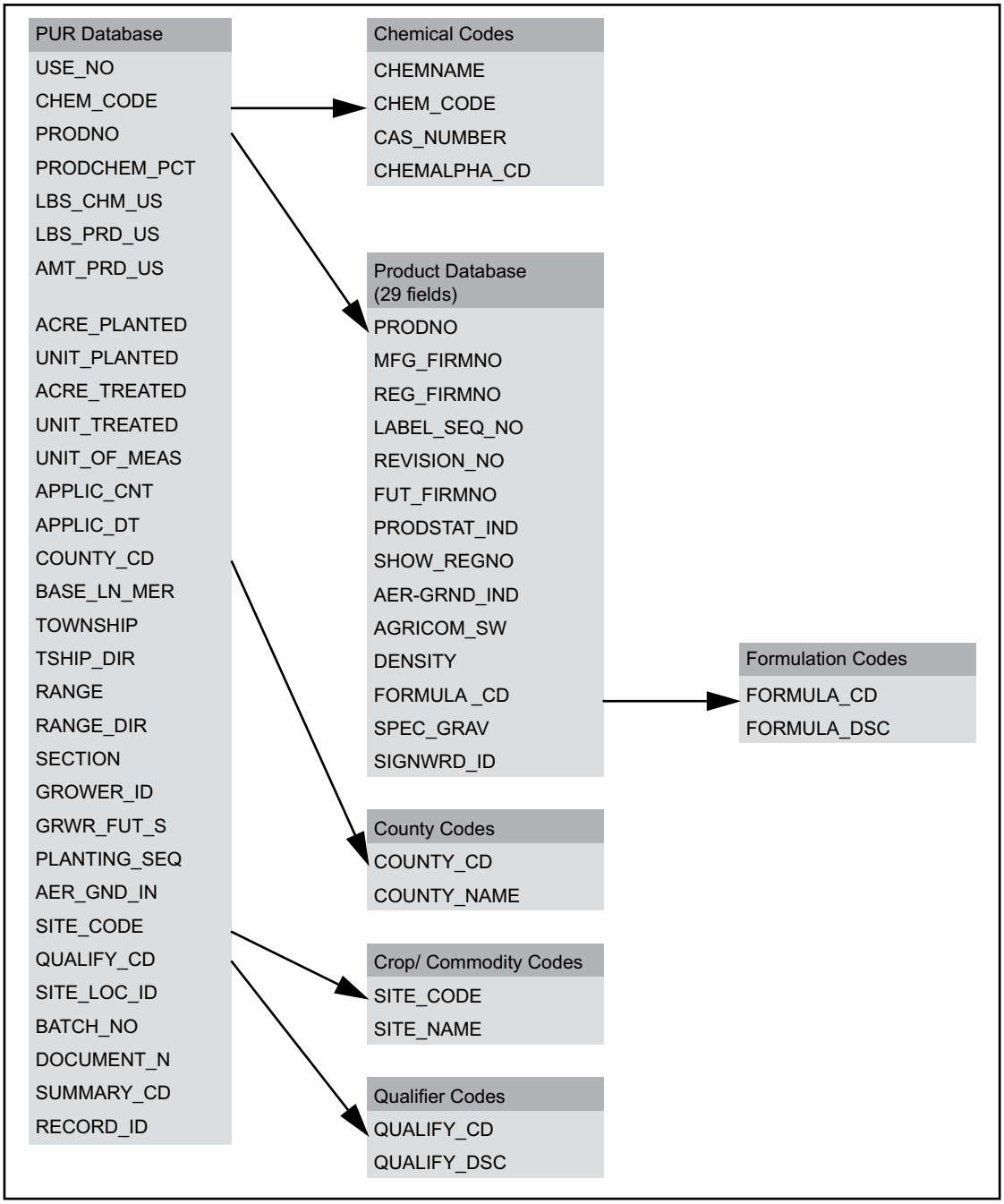
The CD also includes a 88 page documentation on how to import the data, the relations between the different files and a description of each database field. Figure 1 represents the PUR database fields and the fields of the related files. The product database actually contains 29 fields, but not all of them are displayed in the figure. The documentation on the CD-ROM can be found in Appendix CA 2.

Processing the data can be challenging, since they come in fixed field format, ASCI text or E00 format. Another problem is the size of the files. Some county files contain more than 100.000 records. Common data analysis software such as Microsoft Excel has a capacity of 50.000-60.000 records. In order to analyse pesticide use data across California, one file containing all 58 county files must be created, those files have over 3,3 million records and a size of almost 600 MB.

DPR also plans to publish PUR data in a online data base in 2002. This online system will allow Web users to make specific inquiries.[27]

25 California Codes Food And Agricultural Code Section 12841-12847
26 Department of Pesticide Regulation (2001): DPR Balance Sheet, Sacramento, USA
27 ibid. 2

Figure 1: Pesticide Use Report Fields and Related Files Fields



3 Utilisation of Pesticide Use Data

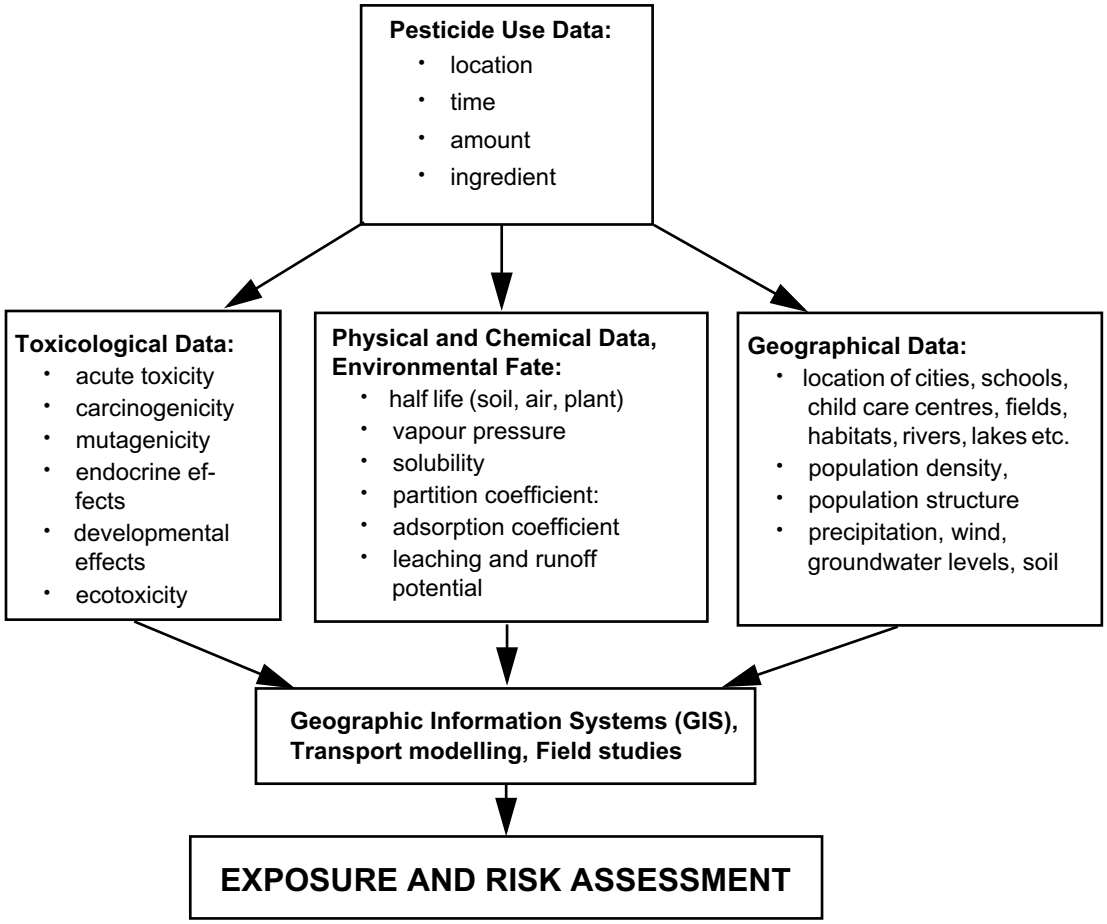
California's pesticide use data have been used for a wide range of purposes. The Department of Pesticide Regulation publishes annual summary reports, which include trends in use by use category, acreage, crop, active ingredient, and toxicity. The last published report contained the 2000 summary data and can be downloaded at DPR's website.[28]

The PUR data sets are mainly used by public interest groups, pest management researchers, grower associations, environmental health professionals, and other research institutes.

The knowledge about the amounts used of a certain active ingredients in a specific location on a specific crop is very valuable for targeted monitoring and the promotion and control of least toxic pest control methods.

Figure 2 presents a model of pesticide exposure assessment using pesticide use in combination with toxicological, chemical, physical properties of the ingredients and geographical information.

Figure 2: Exposure Assessment Model Using Pesticide Use Data



The next sections will present some examples of utilisation of California's pesticide use data.

28 Department of Pesticide Regulation, (2000): Summary of Pesticide Use Report Data 1999, Indexed by Commodity, Preliminary Data, accessible at: http://www.cdpr.ca.gov/docs/pur/purmain.htm, Sacramento, USA

3. 1 Trends, Statistics, and General Information

A common use of pesticide use data is the presentation of trends and statistics. Because of detailed full reporting in California, a large number of different trends can be observed. This ranges from trends of statewide total use, to the use of a specific pesticide on a specific crop, to the pesticide use of an individual farmer in a certain season on a specific crop. Trends can be analysed using the PUR data fields:

- grower ID for farmer
- site location ID for field number which is only unique in combination with the grower ID
- product number for pesticide products
- DPR chemical code for active ingredients
- site code (commodity/ crop)
- county code
- application date (day/month/year)
- MTR Section
- acres treated
- air/ground indicator

Queries can be combined with toxicological and/or chemical information. DPR has published summary analyses of the PUR data, which are available at the DPR website.[29]

The following figures and tables show examples of presented trends and general information extracted from the PUR data. For these examples DPR PUR data bases from 1991-1999 have been used.

3. 1. 1 Top List by Crop/ Commodity

The applicator of a pesticide reports the crop or commodity (site) and the CAC assigns, except for non-agricultural uses, the appropriate site code to it. The site code database contains some 2470 different codes for all kinds of crops and commodities, although in practice only some 264 are used. Various queries are possible using the site code.

Table 5: Top Fifteen Crop/ Commodities in 1998

Crop/ Commodity	Pounds Used	Percent of Total
grapes, (table or raisin)	34.716.574	16,1
grapes, wine	34.295.009	16,0
almonds	16.142.013	7,5
tomatoes, for processing/canning	11.631.716	5,4
oranges	10.205.999	4,7
cotton	9.531.512	4,4
strawberries	7.214.608	3,4
structural pest control	5.874.636	2,7
sugar beets	4.996.234	2,3
rice	4.938.694	2,3
carrots	4.910.928	2,3
peaches	4.661.128	2,2
walnuts	3.924.009	1,8

29 ibid. 28

Table 5: Top Fifteen Crop/ Commodities in 1998		
Crop/ Commodity	Pounds Used	Percent of Total
lemons	3.917.744	1,8
SUM TOP 15	156.960.802	73,0

3. 1. 2 Top List By Pesticides

The user of a pesticide reports the product number of the applied pesticide product. The chemical code database contains some 3580 different codes for pesticide active ingredients and adjuvants. A wide variety of queries can be done using the DPR chemical code.

Table 6: Top Fifteen Pesticides in 1998		
Pesticide	Pounds Used	Percent of Total
sulfur	78.399.054	36,5
petroleum oil	21.556.738	10,0
metam-sodium	13.958.388	6,5
methyl bromide	13.888.931	6,5
copper hydroxide	5.312.365	2,5
mineral oil	4.993.692	2,3
glyphosate, isopropylamine salt	4.540.351	2,1
copper sulphate (pentahydrate)	3.353.991	1,6
chloropicrin	2.969.472	1,4
calcium hydroxide	2.823.606	1,3
1,3-dichloropropene	2.782.413	1,3
cryolite	2.440.841	1,1
sodium chlorate	2.417.467	1,1
chlorpyrifos	2.374.727	1,1
SUM TOP 15	161.812.036	75,3

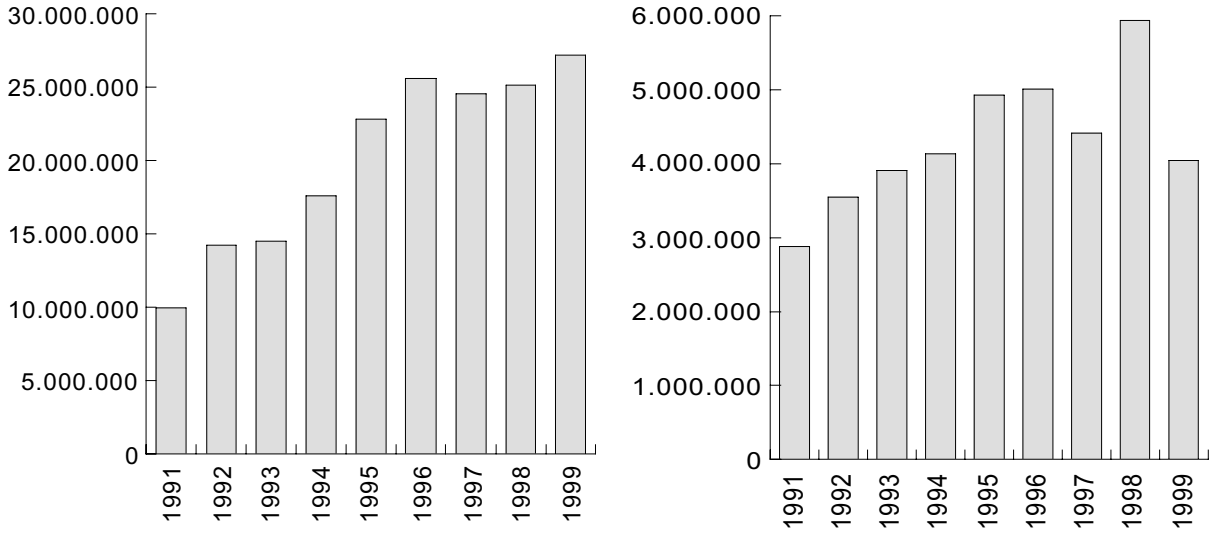
3. 1. 3 Trends over Time for Toxicity Classifications

Most pesticides have been classified due to their acute and/ or chronic human and environmental toxicity. PUR data can be used to observe trends over time in the use of certain toxicity classifications. DPR publishes in its annual reports the trends for several toxicty classifications. Figure 3 shows for example that the use of probable and/or known carcinogenic pesticide increased dramatically between 1991 and 1999. More detailed analyses were also conducted by Pesticide Action Network North America.[30] [31]

30 Liebman, J. (1997): Rising Toxic Tide, Pesticide Use In California, 1991-1995, Pesticide Action Network North America and Californians for Pesticide Reform, San Francisco, US

31 Kegley, S.E., Orme, S. Neumeister, L., (2000): *Hooked on Poison: Pesticide Use in California 1991-1998*, Pesticide Action Network North America and Californians for Pesticide Reform, San Francisco, USA

Figure 3: Use of Probable and/or Known Carcinogens in California 1991-1999 (right: pounds, left: cumulative acres treated)



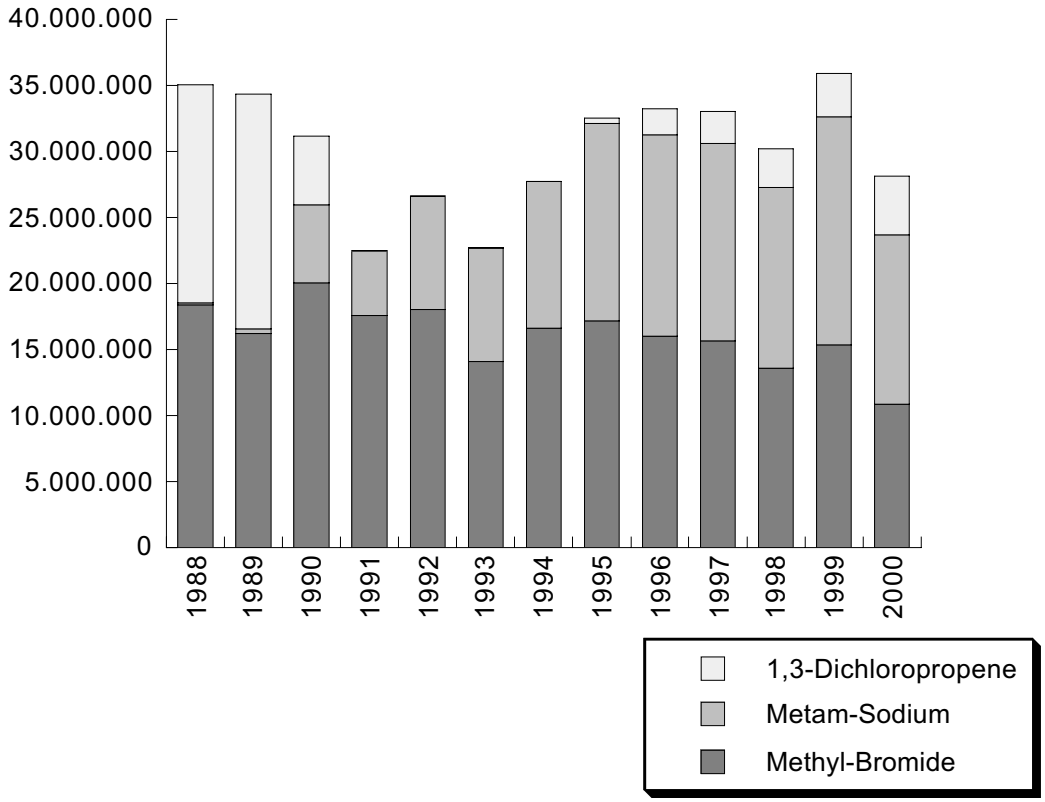
Source: DPR Summary PUR Data 1999 (pesticides listed as B2 = probable carcinogenic by U.S. EPA, and/ or as 'known to cause cancer' in State Proposition 65)

3. 1. 4 Trends Over Time for Pesticides

There are two pesticides primarily responsible for the increase shown in Figure 3, the soil fumigants *metam-sodium* and *1,3-dichloropropene.* In the early 1990's the use of *1,3-dichloropropene* (active ingredient of Telone©) was heavily restricted, due to high concentration in ambient air. Figure 4 shows that is was then replaced by *metam-sodium*. The figure also shows the total use of the 3 major fumigants in California between 1988 - 2000. *Methyl-bromide* a ozone-depleting chemical will be phased-out in the US by the year 2005[32], and *1,3-dichloropropene* is one favourite substitute. Figure 4 shows a decrease on *methyl-bromide* use and an increase of the use of *1,3-dichloropropene* in the timespan 1995 -2000.

32 Schafer, K.S., (1999): Methyl Bromide Phase Out Strategies, A Global Compilation of Laws and Regulations, United Nations Environment Programme (UNEP), Vienna, Austria

Figure 4: Use of 3 Major Fumigants 1988- 2000, in Pounds



Source: DPR Pesticide Use Reports 1988-2000 (all 3 fumigants are restricted use pesticides, therefore date before 1990 do exist, 1999 and 2000 data are preliminary)

3. 1. 5 Information on Individual Crops

Information on the specific pesticide use on a particular crop can be calculated as well. Table 7 shows the top ten pesticides used on strawberries in 1991 and 1997. The total use on strawberries in these years was 7.261.265 and 6.876.030 pounds, respectively. The top ten pesticides used on strawberries comprise 97,6% in 1991 and 97,0% in 1997. The top 3 pesticides represent in 1991 (94,2%) and in 1997 (90,6%).

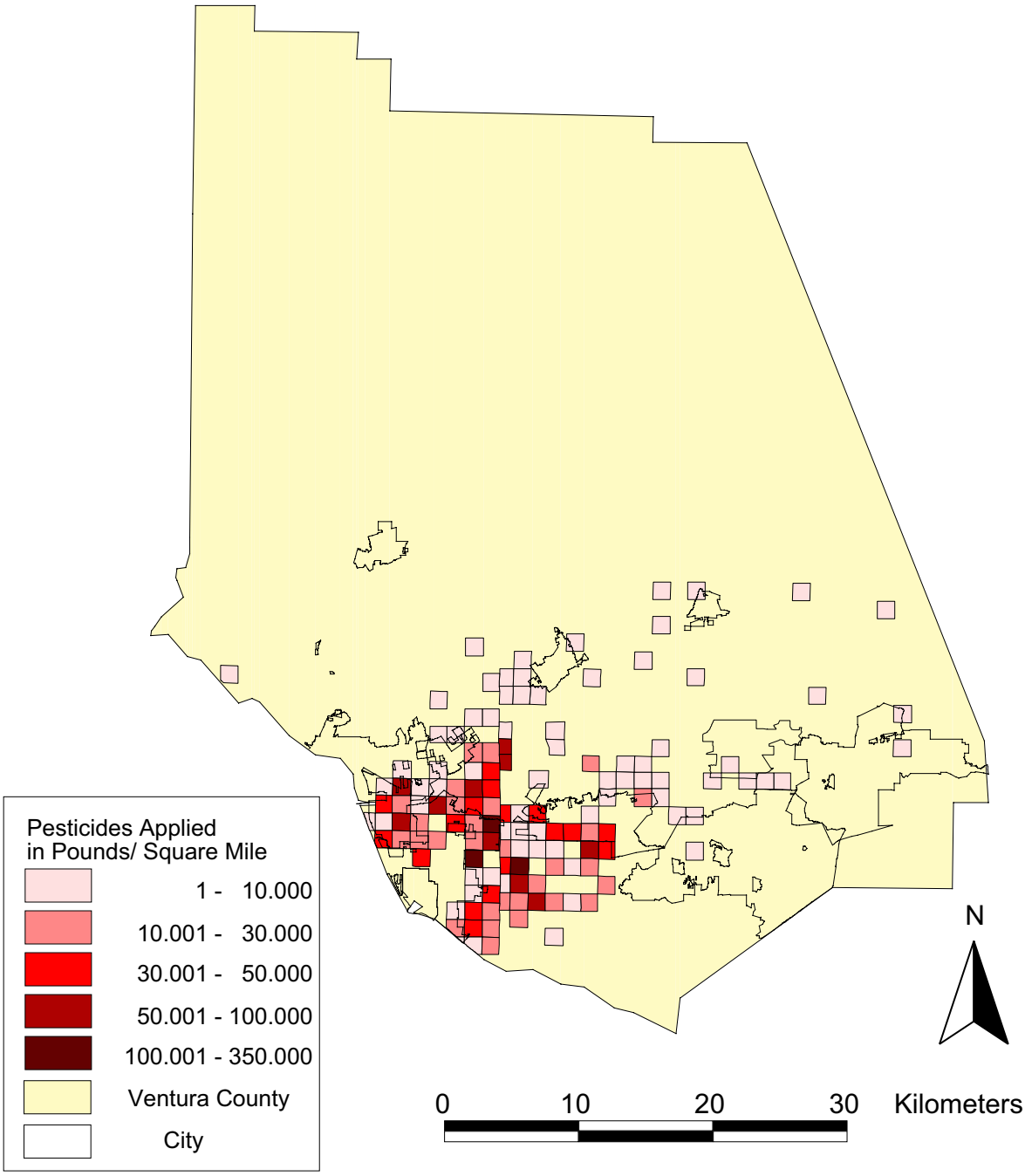
Table 7: Top Ten Pesticides Used on Strawberries

1991		1997	
Active Ingredient	Pounds Used	Active Ingredient	Pounds Used
methyl bromide	4.552.125	methyl bromide	4.055.738
chloropicrin	1.834.375	chloropicrin	1.889.670
sulfur	456.729	sulfur	282.787
malathion	66.262	captan	150.672
thiram	61.003	malathion	103.807
captan	30.012	thiram	86.304
iprodione	28.086	iprodione	30.663
potash soap	27.058	poly-i-para-menthene	27.378
anilazine	17.638	potash soap	25.816

Table 7: Top Ten Pesticides Used on Strawberries			
1991		1997	
Active Ingredient	Pounds Used	Active Ingredient	Pounds Used
propargite	14.277	carbaryl	19.789

Using a GIS-mapping system, pesticide use can be mapped.

Map 3: Pesticide Use on Strawberries in Ventura County 1999



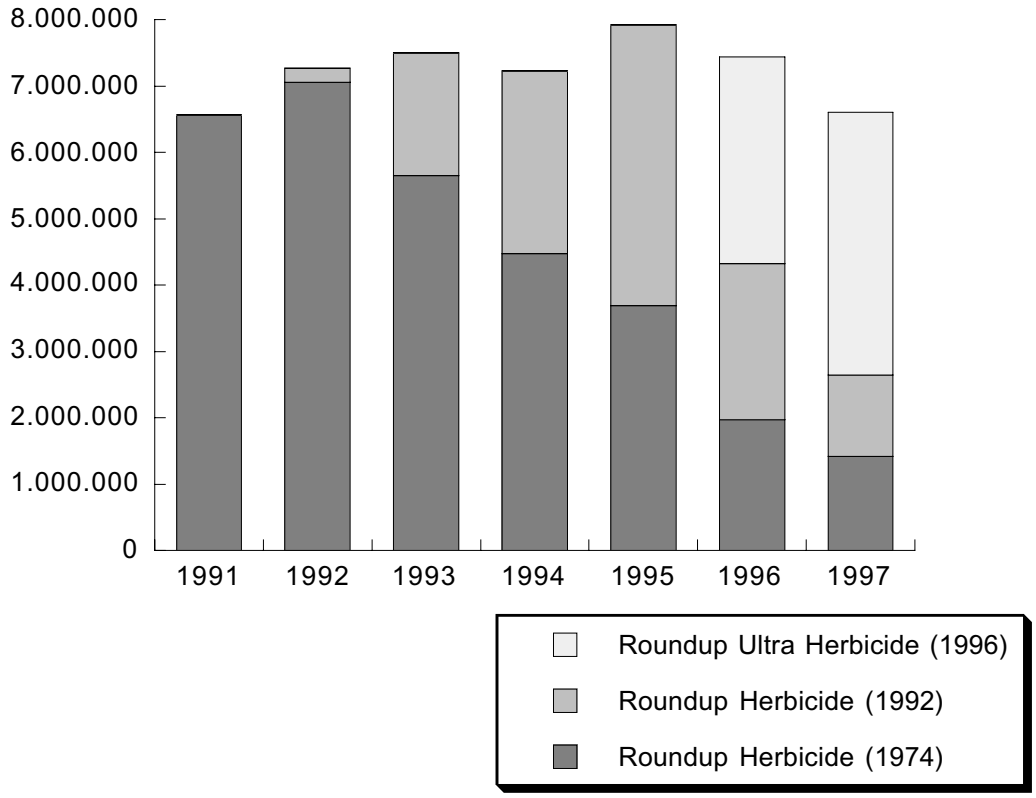
Ventura County is number one in pesticide use on strawberries. The map shows that in three sections, amounts of over 100.000 pounds have been applied. The amount in Section S01N21W08 is over 340.000 pounds of active ingredients. Further analysis of the PUR data shows that one grower is responsible for this amount. The PUR database lists 81 records for

this grower (only strawberries), and shows two main spraying seasons: spring and fall. In spring, only 40 acres of the field were planted and treated with pesticides. From September through December, 170 acres were planted and 165 were treated. High amounts of pesticides were applied in September on 165 acres. One product, a mixture of *methyl bromide* and *chloropicrin,* was applied in this month. The intensity peaks in September at 2.064 pounds per acre (2.311 kg/ha).

3. 1. 6 Information on Individual Pesticide Products

PUR data also makes it possible to observe trends in the use of individual pesticide products using the reported product number. *Glyphosate,* the active ingredient of Roundup©, is one of the top ten pesticides used in California (4.544.557 pounds in 1998), and the number one herbicide in California. Figure 5 shows the use of the 3 major Roundup products and the year of registration in the years 1991 through 1997.

Figure 5: Use of 3 Roundup© Products 1991-1997 in Pounds

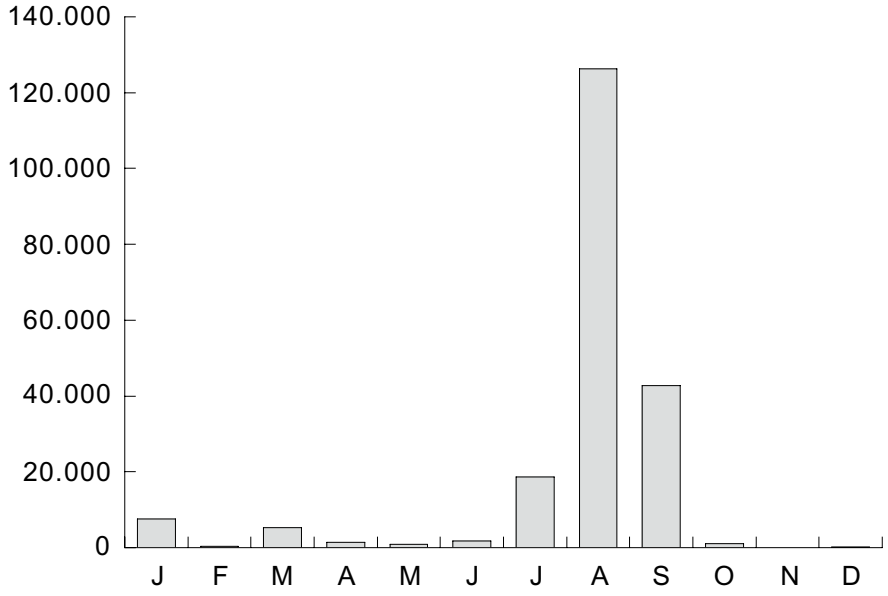


Source: DPR Pesticide Use Reports 1991-1997, DPR Product Database

3. 1. 7 Type and Timing of Applications of Specific Pesticides in a Specific Region

The next figures and tables present a short analysis of aerial applications of *chlorpyrifos* in Fresno County in 1999. The PUR database contains information on two types of applications: ground or air applications. Figure 6 shows the amounts of *chlorpyrifos* applied aerially, over the year 1999.

Figure 6: Amounts Aerial Applied *Chlorpyrifos* in Fresno County Over the Year 1999 (in Pounds)



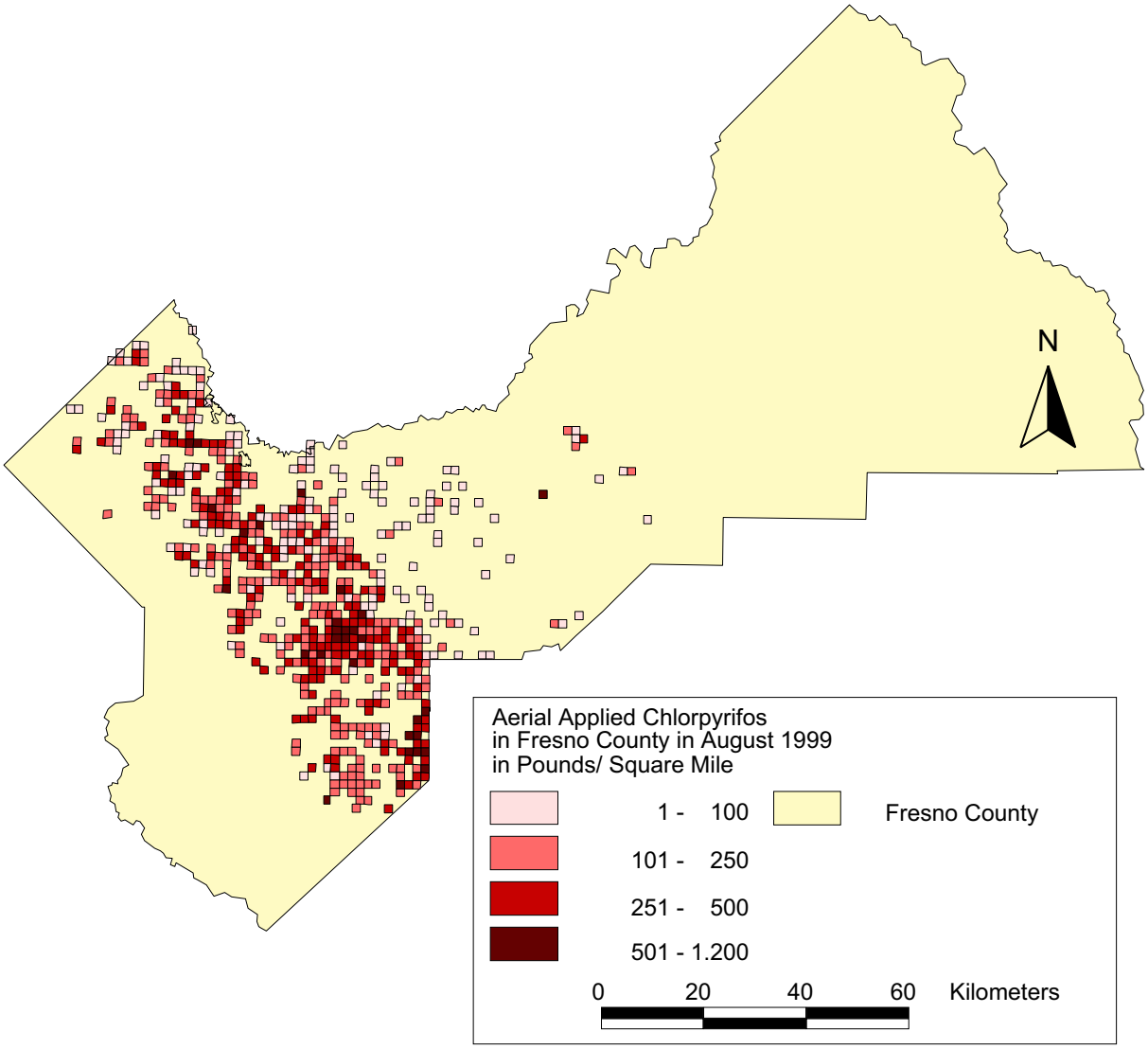
The figure shows that the highest amounts of *chlorpyrifos* applied aerially, occurred in August. Table 8 presents the 11 crops treated with *chlorpyrifos* via air in August 1999.

Table 8: Crops Treated with *Chlorpyrifos* by Aerial Applications in August 1999 in Fresno County

Crop/ Commodity	Pounds Applied	Percent of Total
cotton	100.469	79,58
alfalfa	10.968	8,69
sugar beet	6.010	4,76
broccoli	3.130	2,48
almonds	2.791	2,21
corn, human consumption	1.122	0,89
oranges	853	0,68
asparagus	786	0,62
walnuts	73	0,06
corn (forage - fodder)	37	0,03
sunflowers	10	0,01

The location of aerial chlorpyrifos applications can be determined by mapping. Map 4 presents the use of *chlorpyrifos* in August 1999 in Fresno county.

Map 4: Aerial Applied *Chlorpyrifos* in August 1999 in Fresno County



3. 2 Ground Water Protection

The California Code of Regulation lists on its Groundwater Protection List 49 active ingredients which have the potential to pollute groundwater or have been detected in groundwater. It also lists over 1.500 MTRS sections of one square mile which are Pesticide Management Zones, areas particularly sensitive to ground water pollution.[33] Site-specific records help to track pesticide use in these Pesticide Management Zones.

In cases of groundwater and/or well water contamination with pesticides, the pesticide use data can help determine the source of contamination.[34]

33 California Code of Regulations (Title 3. Food and Agriculture), Division 6., Pesticides and Pest Control Operations, Chapter 4. Environmental Protection, Subchapter 1., Groundwater Article 1., Pesticide Contamination Prevention

34 California Environmental Protection Agency, Department of Pesticide Regulation, (2000): Pesticide Use Reporting, An Overview of California's Unique Full Reporting System, Sacramento, USA

Researchers use pesticide use records to determine the correlation between certain soil types, type and amounts of pesticide used, and the contamination. At DPR, researchers developed an empirical approach to determine vulnerable areas. Areas with detections of pesticides in groundwater were analysed, and common properties such as soil type and ground water level were identified. The purpose of this approach was to find other areas with similar conditions that may be prone to ground water pollution, which would enable DPR to conduct more efficient monitoring, and prevent ground water contamination before it happens. The approach was tested using the PUR data. 43 wells in identified vulnerable areas in Fresno County with use higher than 46 kg per section (1 square mile) of *norflurazon* were sampled for this pesticide. In 8 wells, residues in concentrations ranging from 0,07 to 0,69 microgram/Liter were detected. These result confirmed the developed approach, because *norflurazon* residues had not been detected in the previous groundwater studies.[35]

Since February 2001 *norflurazon* is listed in the Groundwater Protection List and its use in certain areas is prohibited.[36]

3. 3 Surface Water Protection

California pesticide use data deliver valuable information to researchers, who monitor pesticides in surface waters. The data deliver information on the time of applications, the location, ingredients and amounts applied, allowing researchers to conduct targeted monitoring programs. The U.S. Geological Survey's National Water-Quality Assessment (NAWQA) used PUR data to design approaches for surface water investigations. With assistance of Geographic Information System software, pesticide use can be overlaid with previously defined sensitive sites in the San Joaquin Basin. As a result of pre-selection using PUR data, 38 of the 54 sampled pesticides in those sites were detected, and 4 of the 6 most frequently detected pesticides were among the 10 most heavily applied pesticides.[37]

In the San Joaquin-Tulare basin, almonds, walnuts, plums, peaches and nectarines are among the major crops grown. During January and February, these dormant orchards are sprayed with insecticides, primarily with *diazinon*, *chlorpyrifos* and *permethrin*. These applications coincide with the rainy season, and the run-off results high concentrations of pesticides, especially of *diazinon*, that are toxic to zooplankton and fish. Map 5 shows how PUR data can be used to present specific information on use of pesticide in a certain time span and a certain location.[38]

In cooperation with the rice industry and the Central Valley Regional Water Quality Control Board DPR operates a program to reduce contamination of surface water by rice pesticides. PUR data are used to identify specific agricultural practices which lead to surface water contamination. DPR then develops alternative use recommendations to assure protection of surface water from the draining of pesticide contaminated water rice fields. [39]

35 Troiano, J. Marade, J., Spurlock, F. (1999): Empirical Modelling of Spatial Vulnerability Applied to a Norflurazon Retrospective Well Study in California, Journal of Environmental Quality, 28:397-403

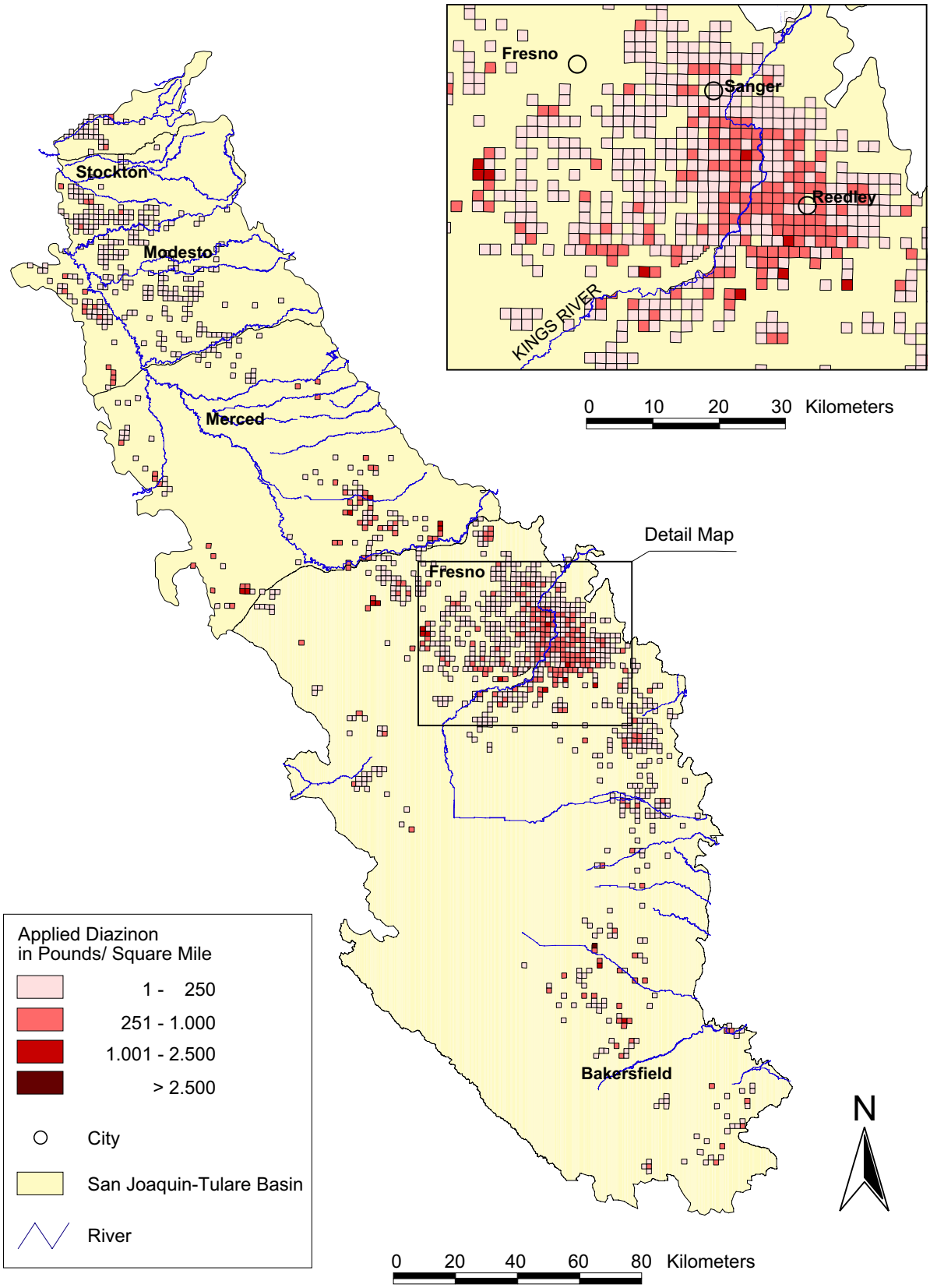
36 California Code Of Regulations, Chapter 2. Pesticides, Subchapter 4. Restricted Materials, Article 4. Use Requirements

37 Domagalski, J.L., (1998): Pesticides Detected in the San Joaquin River Basin, California: Results of an Intensive Fixed-Station Sampling Design Developed for the National Water Quality Assessment Program, U.S. Geological Survey,

38 Kegley, S., Neumeister, L., Martin, T.; (1999): Disrupting the Balance, Ecological Impacts of Pesticide in California, Pesticide Action Network North America

39 ibid. 1

Map 5: Application of *Diazinon* in the San Joaquin-Tulare Basin in January and February 1995



3. 4 Air Quality

The California Air Resources Board (ABR) uses PUR data to track reactive organic gas emissions (ROG) associated with pesticide applications. Pesticides were divided into four use categories, and use data for each of these categories are allocated by county, air district, air basin, and US EPA ozone non attainment area. DPR calculates the ROG emission from the PUR data set and provides that information to ARB.

ARB also makes use of PUR data in designing air monitoring studies, which assess public exposure to airborne emissions of individual pesticides.[40] ARB, in cooperation with DPR, uses GIS to create maps that help researchers identify areas to focus their studies.[41]

3. 5 Risk Assessment

The Medical Toxicology Branch of DPR uses PUR data in dietary exposure analyses. Researcher incorporated the percentage of the commodities treated with specific pesticides in existing point estimates and probabilistic distribution programs. Instead of assuming that 100% of a planted crop area is treated, the actual percentage treated is used. The results showed that under consideration of the actual reported percentage, the margins of exposure (MOE) differ considerably from those MOE formulated under the assumption of a 100% treatment.[42]

3. 6 Epidemiological Studies

Environmental epidemiology identifies and measures the influence of environmental factors (physical, chemical, and biologic) on human disease in a community. It provides the scientific evidence for sound environmental and health policies. Because epidemiology considers real exposures in real population under real life conditions, it can be especially valuable in uncovering the causes of human disease.

3. 6. 1 Potential Exposure in Children

California Department of Health Services used PUR data to conduct a study about potential pesticide exposures in children near the U.S./Mexico border. The goal of the study was to assist the U.S. EPA in determining where potential pesticide exposures are occurring in children in this region. The PUR data provided information on pesticide use in this region, which is composed of two counties, San Diego and Imperial county (see Map 1, County 13 and 37).

PUR data provided information on the top ten pesticides by weight and by application frequency, the top ten agricultural crops treated and the trends in use over the years 1991 through 1995 as well as over the year by month.

Table 9: Top Ten Pesticides (by weight) Applied in Imperial County 1995

Pesticide	Total pounds	Average pounds per application
metam-sodium	3.184.583,6	10.407,1
sulfur	2.401.681,3	1.651,8

40 California Environmental Protection Agency, Air Resource Board (1997): Report for the Application and Ambient Air Monitoring of Aldicarb, Sacramento, USA

41 California State University, (2000): *California's Pesticide Use Reporting System: Public Access, Data Quality and Utilization*, (Conference Paper) Sacramento, USA

42 ibid. 41

Table 9: Top Ten Pesticides (by weight) Applied in Imperial County 1995		
Pesticide	Total pounds	Average pounds per application
methyl bromide	268.962,1	3.404,6
malathion	267.254,5	98,6
trifluralin	250.446,6	121,5
methomyl	148.174,4	25,4
EPTC[a]	147.870,5	157,0
chlorthal-dimethyl	134.561,7	230,8
chlorpyrifos	110.520,0	39,3
dimethoate	78.092,7	21,0

a EPTC = S-ethyl dipropylthiocarbamate

The PUR data also include the location of the applications by square miles. Different sources for census data provided information on the child density, the age and gender distribution. the locations of schools, parks, day care centres, churches and migrant camps.

The top ten pesticides used by weight between 1991 and 1995 were classified by the toxicological properties such as acute toxicity, acetylcholinesterase inhibition, carcinogenicity, reproductive and developmental toxicity and effects on the respiratory system.[43]

Table 10: Toxicity Classification of the Top Pesticides by Weight (1991-1995)						
Pesticide Name	Chemical Class	Toxicity Class (acute effects)	AChe Inhibition	EPA Cancer Classification	Repro./Dev. Effects	Respiratory Irritation
chloropicrin	CCl3NO2	I (eye)			X	X (severe)
chlorothalonil	Nitrile	I		B2		X
chlorpyrifos (Dursban)	OP	II	X			X
chlorthal-dimethyl	Phthalate	IV				
copper hydroxide	metal	III				X
diazinon	OP	II or III	X		X	X
dienochlor	organochlorine	II				
dimethoate	OP	II	X	C	X	X
endosulfan	Chlorinated HC*	I				
EPTC	Carbamate	III	X		X	X
glyphosate (Roundup)	OP**	I (eye)				X
malathion	OP	III	X			X
metam-sodium	Carbamate	I		B2	X	X (severe - MITC product)
methomyl	Carbamate	I	X			X
methyl bromide	Alkyl bromide	I			X	X
mineral oil (petroleum)	Mixture of HC					X

Table 10: Toxicity Classification of the Top Pesticides by Weight (1991-1995)						
Pesticide Name	Chemical Class	Toxicity Class (acute effects)	AChe Inhibition	EPA Cancer Classification	Repro./Dev. Effects	Respiratory Irritation
petroleum oil	Mixture of HC					X
potash soap	***					
propargite	Sulfite ester	I		B2	X	
simazine	Triazine	IV		C		
sulfur	elemental sulfur	IV				X
trifluralin	Dinitroaniline	I, II or III		C		

Key:

AChe = acetylcholinesterase
EPTC = S-ethyl dipropylthiocarbamate
MITC = methyl isothiocyanate
OP = organophosphate
* = sulfurous acid ester of chlorinated cyclic diol (cyclodiene subgroup)
** = an OP compound (a phosphonoglycine) but not an OP ester (does not inhibit AChe)
*** = potassium salt of tall oil fatty acids
B2 = probable human carcinogen; C = possible human carcinogen
C = possible human carcinogen

Maps 6 and 7 present findings of the report, showing the location of schools and the use of the respiratory irritants in 1995.

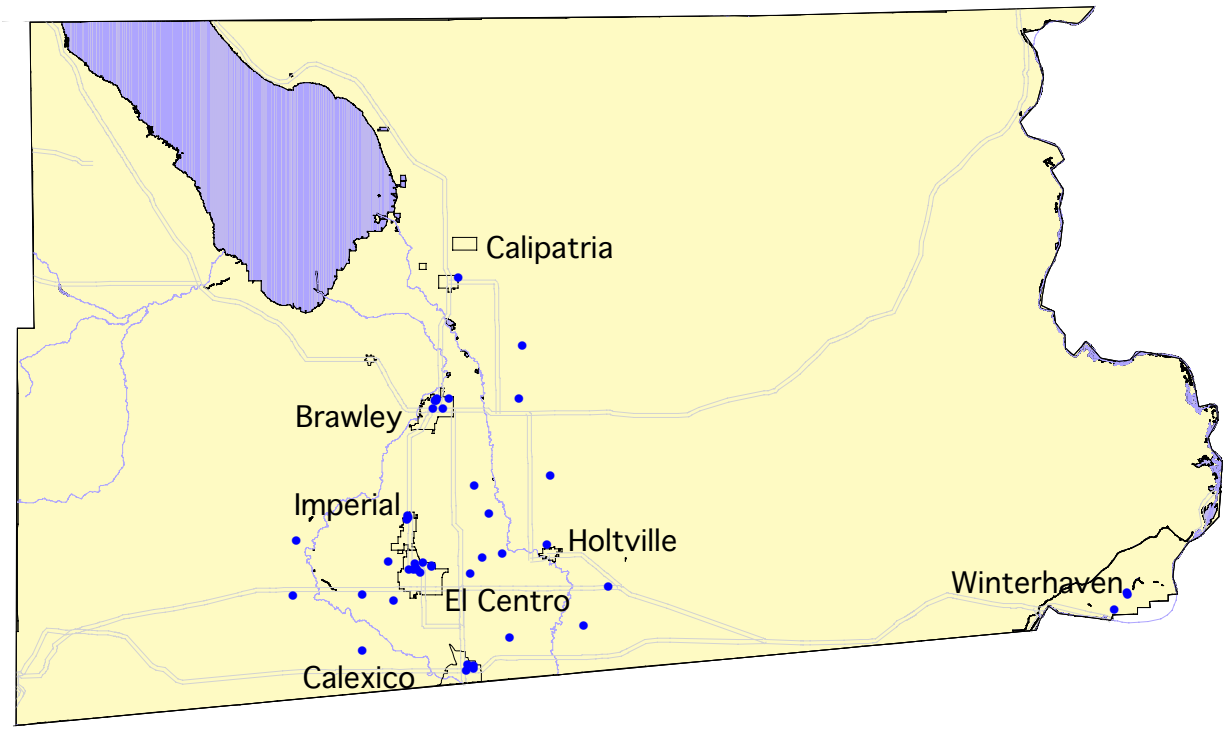
The California Department of Health Services, Environmental Health Investigation Branch also conducted a study on the potential exposure of children to pesticides. In a first step pesticides active ingredients were grouped with regard to their chemical class and their toxicity. Chemical groups were organochlorines, organophosphates, carbamtes and dithiocarbamates. Toxicity groups were probable and possible carcinogens (U.S. EPA/ OPP Class B and C)[44], genotoxic compounds, and developmental or reproductive toxicants. The PUR database with data 1991 through 1994 provided data of the amounts of each chemical and each toxicity group used per MTR Section (1 square mile). An annual average per square miles was calculated. GIS software was used to overlay the MTR Sections with census block groups and to calculate the average pesticide use density (pounds/square mile) per census block. Census block groups with an average use higher than 1000 pounds/ square mile and group were defined as areas with 'high pesticide use density'. The number of children under age 15 living in these 'high use' areas were obtained from the 1990 census data. The results showed that 382.000 children live in areas with high use of developmental or reproductive toxicants, that 135.000 children live in areas with high use of probable and possible carcinogens, and that 417.000 live in areas with high use of genotoxic compounds.[45]

43 Impact Assessment, Inc., California Department of Health Services, Environmental Health Investigations Branch (2000): Analytical Procedures, Methodologies, and Field Protocols to Monitor and Determine Environmental Contaminants: Pesticide Use in California: U.S./Mexico Border Region, Oakland, USA

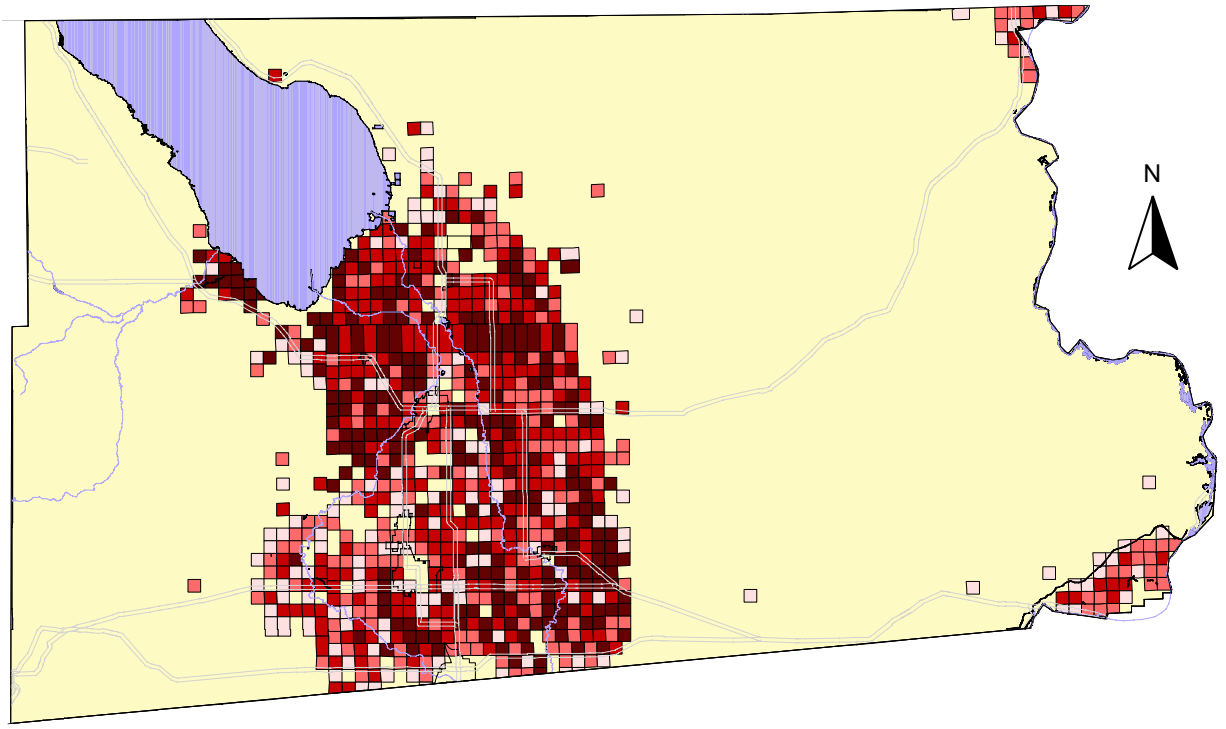
44 US Environmental Protection Agency Office of Pesticide Programmes (1997): Reference Tracking Report, Washington, DC, USA

45 Harny, M, Gunier, P., Reynolds, P., von Behren, J., Hertz, A. (2000): Areas of High Agricultural Pesticide use in California: How many Children Live There? (Poster presentation), California Department of Health Services, Environmental Health Investigation Branch, Oakland, USA

Map 6: Locations of Public Schools In Imperial County



Map 7: Aggregate of Respiratory Irritant Use in 1995



Highways
Cities
Rivers
Lakes
Schools
Imperial County

Total Annual Pounds of Respiratory Irritants of Top 10 Pesticides

<= 356
<= 1.559
<= 8.545
<= 131.384

0 10 20 Kilometers

Source: California Department of Health Services, Environmental Health Investigation Branch (1998): Analytical Procedures, Methodolgies, and Field Protocols to Monitor and Determine Environmental Contaminants: Pesticide Use in California: U.S./Mexico Border Region, (Figure 3A and 23), Oakland, USA

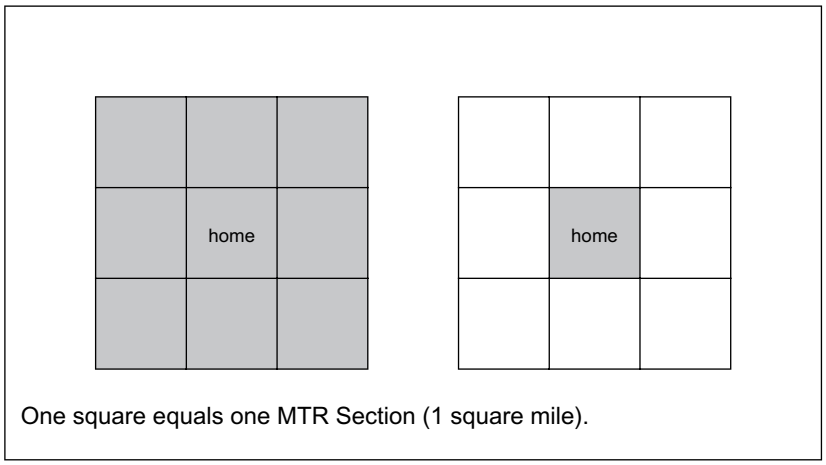
Redone and Modified by Lars Neumeister, Pesticide Action Network Germany (2001)

Other epidemiological studies are currently in progress. The Center for Children's Environmental Health Research at the University of California Berkeley (UC Berkeley) is conducting a study which investigated the association of organophosphates (OP) in urine, blood and breastmilk of pregnant women and children with nearby and home pesticide use. Samples of house dust, air, clothing and food are collected as well. PUR data will be summarised by square mile (one MTR section) for different time periods, daily, weekly, monthly and annually to evaluate the nearby pesticide use.[46]

3. 6. 2 Pesticides and Fetal Death

Researchers at the University of North Carolina have used PUR data to conduct a case-control study to evaluate the association between fetal deaths and pesticides by overlaying maternal addresses and pesticide applications during pregnancy. This study began in 1984 at a time when only restricted use pesticides and applications by commercial pest control operators were reported. Comprehensive information on the circumstances of the pregnancy, the cause of death due to congenital anomalies, and the proximity to pesticide applications were gathered. 73 cases in ten counties were identified and 611 control cases in the same counties were randomly selected. The PUR data provided the date of each application within two spatial exposure definitions. A broad definition of exposure includes 9 MTR sections around the maternal address (each 1 square mile), a narrow definition comprises the one section in which the mother lived (see Figure 7).

Figure 7: Exposure Classification Based on the Relationship of Pesticide Application (grey) to Residence (Left: broad definition, Right: narrow definition)



All applications after conception within the exposure definitions were extracted from the PUR data and the pesticides categorised according to their chemical class or their potential to disrupt the endocrine system. Information on the type of application, ground or aerial was also included in the analyses. The results of the statistical analysis showed that exposures of women with fetal deaths increased towards the time of organogenesis (3rd - 8th week of gestation) compared to the control group.[47]

46 personal communication with Asa Bradman, CHAMACOS Center for Health Assessment of the Mothers and Children of Salinas, Berkeley, USA (http://www.chamacos.org/)

47 Bell, E. M., Hertz-Picciotto, I., Beaumont, J.J., (2001): A Case Control Study of Pesticides and Fetal Death due to Congenital Anomalies, Epidemiology, Vol. 12 No. 2

3. 7 Pest Management

DPR uses the PUR database to understand patterns and changes in pest management practices. This information can be used to determine possible alternatives to pesticides that are subject to regulatory actions and to help determine possible impacts of different regulatory actions on pest management.[48]

The California Association of Winegrape Growers (CAWG) conducted an in-depth analysis of the winegrape pest management system to meet the goals of the Food Quality Protection Act (FQPA). In partnership with the US EPA and the University of California Sustainable Agriculture Research and Education Program (UC SAREP) CAWG developed crop pest profiles using PUR data.[49]

The Department of Plant Pathology of UC Davis used PUR data to determine if the amounts of inorganic copper applied as pesticide on perennial crops may ultimately reduce soil function. Data on copper treated areas were extracted from the PUR database, and application rates per crop and county were calculated and compared over several years. Use of copper alternatives was observed to determine possible replacement patterns.[50]

3. 8 Evaluation of Integrated Pest Management

In response to regular contamination of surface water, especially with *diazinon* and *chlorpyrifos* in the winter season, the Biologically Integrated Orchard System (BIOS) was initiated in 1993 focusing first on almonds. This voluntary program was developed to reduce the reliance on targeted agricultural chemicals. The BIOS project for almonds started in 1993 and 1994 in Merced and Stanislaus County, and the target for pesticide reduction was *diazinon.* PUR data were used to evaluate the success of the program. BIOS promotes *Bacillus thuringensis* as alternative to insecticides, as well as the release of beneficials, use of cover crops and other biologically based farming practices to reduce the chemical input. The Site Location ID, the amounts of pesticides used, the acreage treated, and the date of application in the PUR database were used to analyse the use pattern of the BIOS growers in comparison to other growers in the county. The evaluation showed that already in 1994 (Merced County) and 1995 (Stanislaus County) BIOS growers eliminated the use of diazinon in the dormant season, and in the following year 74% and 80% of the growers used *Bacillus thuringensis*, in comparison to 32% and 16% in the rest of the county.[51]

100 almond and walnut producers in seven counties are now participating in the BIOS program. [52]

The University of California IPM Program also evaluated use of organophosphates (OPs) and pyrethroids in almond and stone fruits using PUR data between 1992 and 1998. The researchers calculated the total pounds of pesticides used per acre of crop for each year and county.

48 ibid. 1
49 California Grape Advisory Team, FQPA Grape Partnership (2000):Crop Profile: Wine Grapes In California, Sacramento, USA
50 Epstein, L., Bassein, S. (2001): Pesticide Applications of Copper on Perennial Crops in California, 1993 to 1998, Journal of Environmental Quality 30: 4-SC, JEQ 12837
51 Epstein, L., Bassein, S., Zalom, F.G., Wilhoit, L.R, (2001): Changes in pest management practice in almond orchards during the rainy season in California, USA, Agriculture, Ecosystems and Environment 83 (2001) 111-120
52 website of Community Alliance with Family Farmers (CAFF) http://www.caff.org/caff/index.html

PUR data showed that the use of OPs was significantly reduced, while use of pyrethroids increased.[53]

3. 9 Wildlife Protection

DPR maintains an endangered species project. Information on the location of pesticide use and the location of habitats can be overlaid with GIS. There are mainly three objectives of the project, to resolve potential problems in case habitats of endangered species overlap, to observe use pattern nearby habitats to assess the potential impact, and to design restrictions on pesticide use in order to protect endangered species while still allowing pest control.[54]

3. 10 Public Right to Know

The first thorough analysis of the California PUR data was conducted by the Pesticide Action Network North America (PANNA), in a report titled 'Rising Toxic Tide.' The report showed that pesticide use in California between 1990 and 1995 increased in amounts as well as in toxicity.[55] The report was followed with 'Hooked on Poison' which evaluates trends in use through 1998.[56]

PANNA has now developed an interactive website to query the PUR database individually by crop, chemical and geographic area (www.pesticideinfo.org).[57]

Californians for Pesticide Reform, a coalition of over 150 public interest groups, published online county maps of total pesticde use for the year 1999.[58]

DPR publishes PUR summaries online and will also establish an online database in 2002 that will allow specific inquiries by Web users.

53 Epstein, L., Bassein, S., Zalom (2000): Almond and stone fruit growers reduce OP, increase pyrethroid use in dormant sprays, California Agriculture, Volume 54, Number 6

54 ibid. 1

55 Liebman, J. (1997): Rising Toxic Tide, Pesticide Use In California, 1991-1995, Pesticide Action Network North America/ Californians for Pesticide Reform, San Francisco, USA

56 Kegley, S. E., Orme, S. Neumeister, L., (2000): *Hooked on Poison: Pesticide Use in California 1991-1998*, Pesticide Action Network North America and Californians for Pesticide Reform, San Francisco, USA

57 personal communication with Susan Kegley, Staff Scientist, Pesticide Action Network North America (PANNA)

58 Website of Californians for Pesticide Reform http://www.igc.org/cpr/datamaps/maps.html

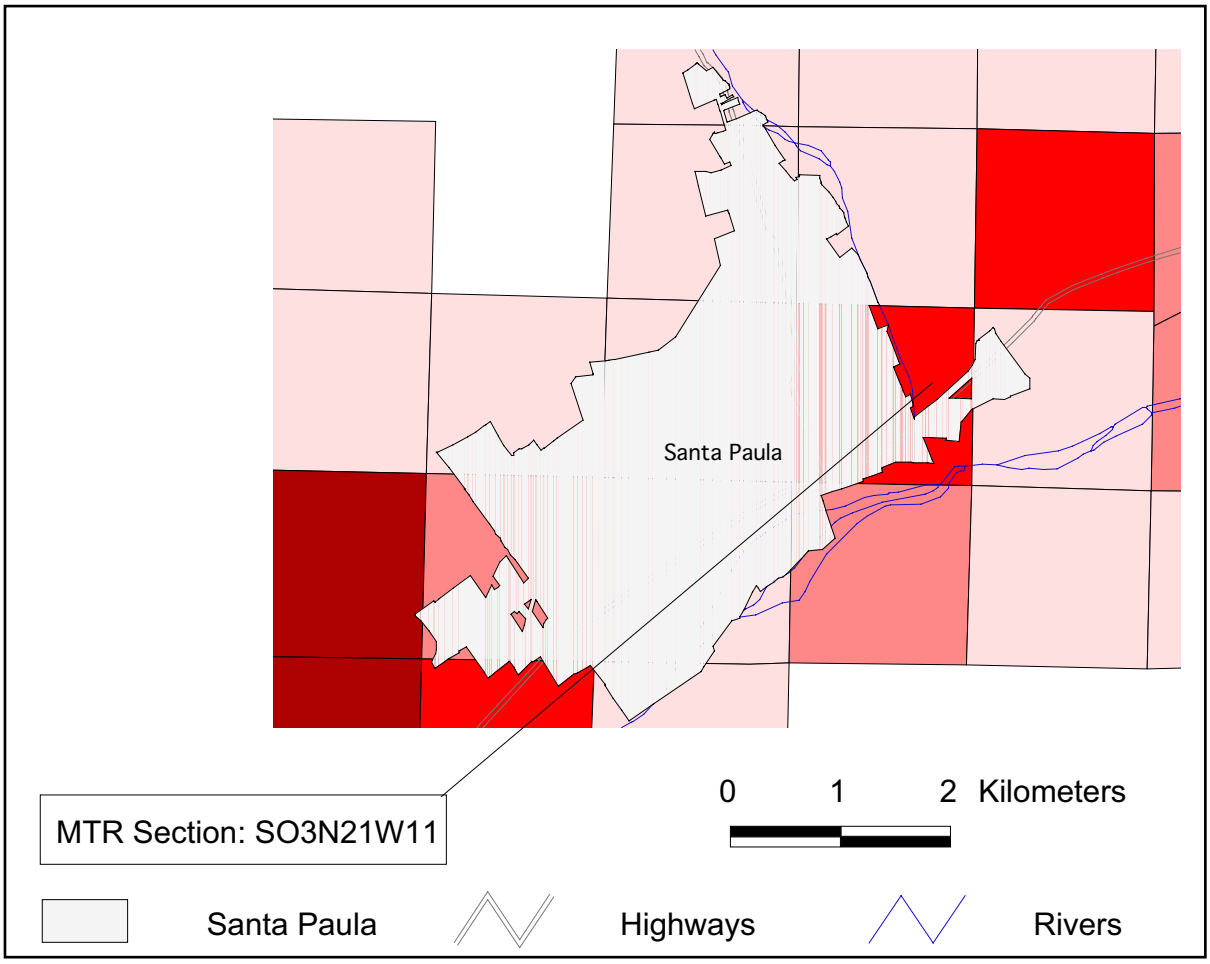
4 Weaknesses of the California PUR System

In May 2000 a conference on California's pesticide use reporting system was held. The conference paper lists 5 pages of problems, issues and additional needs of the PUR system. This list is not entirely repeated in this place since DPR already developed a plan to improve the PUR system. The improvement plan can be found in Appendix CA 3. The weaknesses listed here are additions to those in the conference paper and should be viewed in the context of a future development of a PUR system in Europe. A Summary of identified weaknesses and possible solutions can be found in Table 11 on page 36.

The Grid System

The smallest unit within MTRS grid system is one square mile. Even if this small scale has to be considered exceptional in comparison with other countries, it has some limitations. The amounts of pesticide use reported by one square mile can lead to inaccurate estimations of the intensity of the pesticide use, since the size and location of the fields is not reflected. Figure 8 illustrates, for example, that different land uses occur in section SO3N21W11, and that the agricultural area is probably much smaller then one MTR section.

Figure 8: Example of Land Use within the MTRS Grid



DPR, in cooperation with the CACs, established a working group to address the problem of the exact field location to improve DPR's Restricted Materials Permit Program (RMPP). The Kern County CAC located the fields of each permitee using different sources on paper maps and digitized them in GIS software.[59]

Inert Ingredients

DPR's pesticide Product Label Database only contains information on the total percentage of all inert ingredients in a product. Therefore, statistics on the use of individual inert ingredients cannot be conducted. Inert ingredients can be as toxic as active ingredients, and detailed data are necessary to calculate, for instance, the emission of VOCs (volatile organic compounds).

The only information about inert ingredients available form the 'open public' PUR database is the percent in each product, deduced by subtracting the percent active ingredient from the total.

For the registration process, the registrant is required to submit data about all ingredients of a product. The inclusion of data on the inerts into the Product Label Database seems to be a minor task. The calculation of the use data would then be just mathematics.

Agriculture

In order to compare pesticide use in amounts, application frequency and environmental impacts of different farming practices, such as cultivation of genetically modified crops, organic farming, tillage vs. non-tillage farming and crop rotation vs. no-crop rotation, additional information on the types of crops and farming practices is needed. For this purpose, several new fields and/or site codes would need to be added to the existing form and the coding system.

Several field specific information are missing to evaluate the PUR data in a useful way. Calculating the treated acres as well as the planted acres can be very troublesome. The site location ID is not unique, and farmers report the planted acreage with every application again. An additional field with the total field size on the reporting form could solve this problem.

Strip treatments are often reported not accurately. Applicators need to be trained to report more accurately.

Information on the type of application can be very valuable for the assessment of residential exposure nearby applications, there is a distinction between, aerial and ground applications. Injections into the soil should be another distinction.[60]

Non-Agricultural Use

1. In the current reporting form a field for treated acres needs to be added (golf courses and recreation areas).

2. In the form a field for the estimated volume of treated rooms needs to be added (all buildings, vehicles).

3. Epidemiological studies on the effects of pesticides are often very complicated due to missing exposure data. For applications in residential homes and gardens, the family name and the age of the inhabitants should be recorded. Those data could be handled confidentially to the public, but open to public health researchers.

59 http://www.cdpr.ca.gov/docs/county/pumpdvlp/pumpmenu.htm
60 Bell, E. M., Hertz-Picciotto, I., Beaumont, J.J., (2001): A Case Control Study of Pesticides and Fetal Death due to Congenital Anomalies, Epidemiology, Vol. 12 No. 2

4. Applications to rights-of way are currently not reported by location. Pesticide applied near of railway tracks are often responsible for point source groundwater pollution. In order to define sensitive areas and locate the use, the MTR sections of the applications should be reported as well.

5. Structural use, use in schools excepted cannot be allocated. Identifying information for the location is very valuable for the exposure assessment.

6. To conduct exposure assessments, more efficient coding systems for schools, day care centres and other locations with vulnerable populations should be developed.

7. Use in areas with vulnerable populations should be reported separately for each single application. The current monthly summaries are not sufficient to assess pesticide risks.

Table 11: Weaknesses of the California PUR System and Possible Solutions

Problem	Solution 1	Solution 2
Not possible to identify genetically modified crops	separate site codes for modified crops	check box behind the site code: Genetically modified (Y/N)
Not possible to identify organically crops	separate site codes for organically crops	check box behind the site code: Organically grown (Y/N)
Not possible to identify tillage vs. non-tillage farmers	check box behind the site code: Tillage (Y/N)	
Not possible to identify crop rotation practices	check box behind the site code: Crop Rotation: 0 1 2 3 4 5 6... (circle one)	
Missing specific information on the treated field	additional field: total size of the field	
Missing information non-agricultural use	additional field: treated area	
	additional field: estimated room volume	
	additional field: family name	
	additional fields: age of the inhabitant	
Missing information non-agricultural use (right-of-ways)	creation of separate use reporting form, which includes the location (MTRS)	

Table 11: Weaknesses of the California PUR System and Possible Solutions		
Problem	Solution 1	Solution 2
Missing information non-agricultural use (structural use)	creation of separate use reporting form, which includes the location (MTRS and/or postal address)	
	development of codes for schools, day care centres, etc.	
	individual reporting of pesticide use in areas with vulnerable populations - creation of a separate reporting form	

5 Oregon‘s Pesticide Use Reporting System

“Information on overall pesticide use alone is of little value in addressing specific pesticide usage on potential impacts on human and environmental health. Pesticide use estimates, based on informal survey methods, do not provide the level of detail and accuracy required by government agencies, researchers, and the public to make informed decisions regarding pesticide use. Also, the collection of pesticide use information needs to be expanded to include all uses in both urban and rural settings.”[62]

In 1999, the Governor of Oregon signed House Bill 3602, the legal act to establish pesticide use reporting in Oregon. House Bill 3602 states in Section 3: *“The Legislative Assembly finds and declares that the development of a comprehensive, reliable and cost-effective system for collecting and organizing information on all categories of pesticide use in Oregon is needed by government agencies, researchers, policy makers and the public to ensure the public health and safety and to protect Oregon's water and environment.”* [63] In Section 4 the extent of the pesticide use reporting is further described:

“The State Department of Agriculture shall establish and implement a pesticide use reporting system to meet the need described in section 3 of this 1999 Act. In establishing and implementing the system, the department shall:

(1) Design, develop and implement the system in order to collect, evaluate, summarize, retain and report information on the use of pesticides in each major category of use in Oregon, including agriculture, forestry, industrial, urban commercial and urban homeowner uses.

(2) At least one time each year, collect the best data practicable from each major category of pesticide use in a manner that reduces paperwork and reporting costs.

(3) Require all pesticide users to report basic information on their use of pesticides that includes, at a minimum:

(a) The watershed, county, zip code or other identification of the location as recommended by the work group established in section 5 of this 1999 Act for the location of use;

(b) The name and United States Environmental Protection Agency registration number for the pesticide product used;

(c) The quantity of pesticide product applied;

(d) The purpose of and type of site of the application;

(e) The month of the application; and

(f) Other data gathered by pesticide applicators that is necessary to achieve the purposes of section 3 of this 1999 Act.

(4) Develop a mechanism to ensure the accuracy, reliability and validity of the database by providing for an independent review of the pesticide use data and collection procedures by data quality assurance specialists.

62 Rothlein, J., Jenkins, J. (2000); Oregon Pesticide Use Reporting System, Analytical Review, Oregon Department of Agriculture, Salem, USA

63 70th Oregon Legislative Assembly--1999 Regular Session, (1999): House Bill 3602, Eugene, USA

(5) Develop a specific mechanism to identify household and other urban uses of pesticides. If this mechanism involves sales reporting by retail pesticide dealers, the department shall develop a minimum monthly sales quantity below which the retail pesticide dealer is exempt from reporting.

(6) Implement a limited size, pesticide reporting pilot program on or before January 31, 2001.

(7) Begin operation of the statewide required data reporting program on January 1, 2002." [64]

5. 1 Pesticide Use in Oregon

Agriculture

With the beginning of 2002, the pesticide use reporting program started. Results are not yet available. Before House Bill 3602 pesticide use information was only estimated for agricultural use. Users of restricted use pesticides, pesticide operators, public pesticide applicators, and commercial pesticide applicators not employed by an operator were required to keep records of their pesticide use. Since the 1980s the Oregon State University Agricultural Chemistry Extension conducted several surveys to estimate agricultural pesticide use. The surveys between 1996 and 1999 indicated that approximately 13,4 million pounds (6,1 million kg) of active ingredients are used annually in Oregon's agriculture. In Oregon, approximately 34.030 farms exist, and over 200 crops are grown on Oregon's 5,3 million acres (2,1 million hectare) of cropland. The next table shows the number of farms by farm size in Oregon in 1997.[65,66]

Table 12: Number of Farm by Farm Size in Oregon in 1997

Farm Size in Acre	Farm Size in Hectares	Number of Farms
1 to 9	0,4 to 3,6	7.202
10 to 49	4,0 to 19,8	11.954
50 to 179	20,2 to 72,4	7.120
180 to 499	72,8 to 201,9	3.369
500 to 999	202,3 to 404,3	1.601
1.000 or more	404,7 or more	2.784

Source: NASS

Forestry

As House Bill 3602 states, reporting of pesticide use in forests is required with 1st of January 2002. Before House Bill 3602 came into force, record keeping of chemical use in large parts of Oregon forests was required. The Forest Practices Act was adopted in 1971 and outlined guidelines for forest practices. Almost 12 mill. acres (4,7 mill. ha) of Oregon's 28,5 mill. acres (11,5 mill. ha) forest land falls under this act, and any user of pesticides, petroleum products, adjuvants and fertilisers on this land had to submit a notification before conducting a chemical

64 70th Oregon Legislative Assembly--1999 Regular Session, (1999): House Bill 3602, Eugene, USA
65 U.S. Department of Agriculture, National Agricultural Statistics Service (NASS), (2001): Agricultural Census for Oregon, Washington DC, USA
66 ibid. 62

application and was required to keep records for certain application methods. The notification must include the common name of the chemical, the product brand name and the application method. The application rate for pesticides was assumed to be as recommended by the label. When a pesticide was applied by air or by a pressurized, ground-based, broadcast application system, the operator was required to maintain a daily record of the operation. Applicators were required to keep this information for three years and to make it available to the Department of Forestry upon request. A standardized form was available for this purpose, and included the following information:

- legal description of the property and number of acres treated
- applicator contractor, applicator (name of person applying the chemical),
- chemical trade name or EPA registration number,
- active ingredient by weight or percent, per acre application rate,
- carrier used,
- date of application including the beginning and ending time of application.
- air temperature,
- relative humidity,
- wind speed and,
- wind direction.

The weather conditions must have been measured and recorded hourly for aerial applications and at the beginning and end of each day for ground-based applications. Applications near waterways and sensitive habitats require a special notification, which also includes a description of the protected resource, geographical information (detailed maps of the site) and protection measures. These notifications are available to citizens who hold an annual subscription applying to an area of interest, to persons who hold downstream water rights within 10 miles, and community water system managers are notified where the surface water drainage area upstream of their intake is 100 square miles or less.[67] Information on the amounts and kinds of pesticides used on Oregon's forest land are not yet available.

Urban and Industrial and Private Use

Information on urban and industrial pesticide use as well as on homeowner use in Oregon is not available.

67 ibid. 62

5. 2 Start of the Oregon PUR System

The generation of the Oregon pesticide use reporting system can be seen as a very elaborate and well planned project, which greatly benefited from the experience of existing PUR systems and from the expertise of Oregon Health Science University and Oregon State University. As the following timetable shows, from signing the House Bill in September 1999 until the start of the full reporting system only, 27 months elapsed.

Table 13: Timetable of the Oregon Pesticide Use Reporting Program

Date	Event
September 1, 1999	House Bill 3602 signed into law
October 1999	Governor appoints 18 member advisory work group
January 2000-June 2003	Advisory work group conducts meetings
May 1, 2000	ODA publishes analytical review
January 31, 2001	Begin limited size pilot system
June 2001 - December 2001	ODA drafts rules associated with reporting program
January 1, 2002	Begin implementation of full reporting system
July 1, 2003	ODA publishes first annual report summarizing the data
December 31, 2009	Program ends unless renewed

For the 2001-2003 biennium, the state legislature provided funding of $1,9 million for the system development and $700.000 for the operation of the program.

In January of 2001, the Oregon Department of Agriculture (ODA) started a limited size pilot reporting system. The voluntary pilot program was promoted mainly through media stories, advertisements and presentations to interest groups. The participants could choose to report one or two months, March and/or April 2001 or one month from the year 2000 using existing application records. A total of 89 individuals signed on to participate and 40 completed the process.[68] To make the pilot program successful ODA published several documents on its website.[69]

With the start of 2002, mandatory full pesticide use reporting in Oregon is completely electronic. Pesticide users need to access an online database to report pesticide use data. The 14 paper forms in the Appendices of this report are only for the use of the applicator. This means that the paper forms cannot be sent to ODA.

ODA's current electronic reporting program is still in development, the final program will start in November 2002. Data validation before entering the use data includes now the location (TRS, ZIP, GPS) and the EPA product registration number.

Similar to the California PUR system, a state Product Label Database will be used to calculate the amount of active ingredients (see Chapter 2. 3 Product Label Database on page 11 in the California section).

68 personal communication with Ms Vogue, Pesticide Use Reporting Coordinator, Oregon Department of Agriculture, Salem, USA

69 http://purs.oda.state.or.us/purs.htm.

5. 2. 1 Extent of the Reporting System

The Oregon PUR system will be a full reporting system. ODA developed for the pilot project 14 different standardized reporting forms, which can be found in Appendix OR 1.These forms illustrate the extent of the reporting system, but the data are entered electronically as of January 1st of 2002. The forms are designed for 8 different application sites:

- agriculture and forestry
- general sites - not publicly owned (includes residential and commercial buildings, schools, health care, restaurants, golf courses, recreation areas, and vehicles)
- general sites - publicly owned or operated (includes residential and commercial buildings, schools, health care, restaurants, golf courses, recreation areas, and vehicles)
- right-of -ways areas (includes roadways, utility lines, railroads, ditch-banks, and sewers)
- aquatic sites (includes water bodies, irrigation ditches, and wastewater/ drinking water facilities)
- vector/invasive species control areas
- wood treatment facilities
- boat and ship hulls (for all applications using marine antifouling agents)

For multiple chemicals used in a single application, a different form has to be used for the same application site (except for wood treatment facilities and boat and ship hulls).

Each form contains two parts: reporter and contact information, and application information. The first part is the same on all forms. After the first submission of completed forms, the individual reporter gets a Reporter ID Number. After obtaining this ID, it is not necessary to fill out the address information in future forms, except any changes to the address.

The application information varies from form to form. Common fields are:

- Date of application
- County Code
- Public Site (Y/N)
- GPS (Geographic Positioning System) Coordinates
- Site Code
- Pest Code
- Equipment Code
- Product name
- Product ID
- Undiluted amount of product plus unit of measurement,

Treated areas (plus unit) have to be reported for applications on agricultural and forestry areas.

Different information can be reported to determine the geographic location of the application, county codes, GPS coordinates, the address and the MTRS grid coordinates. Different options exist to report the location:

Agriculture and Forestry

- GPS coordinates
- MTRS (Meridian, Township, Range, Section) coordinates

General Sites - Not Publicly Owned

- GPS coordinates
- MTRS coordinates

General Sites - Publicly Owned or Operated

- GPS coordinates
- City
- Street address
- ZIP code

Right-of-Ways (R-O-W)

- GPS coordinates
- MTRS coordinates for start of application
- MTRS coordinates for end of application
- R-O-W name

Aquatic Sites

- GPS coordinates
- MTRS coordinates
- Water body name

Vector/ Invasive Species Control Areas

- GPS coordinates
- MTRS coordinates

Wood Treatment Facilities

- GPS coordinates
- City
- Street address
- ZIP code

Boat and Ship Hulls

- GPS coordinates
- City
- Street address
- ZIP code

It is not known, how many users will report GPS coordinates, since there is no information about the distribution of GPS equipment in Oregons agriculture and forestry.

As a western state of the USA Oregon is covered, like California by a MTRS (Meridian, Township, Range, Section) grid system, which was introduced with the settlement of the western U.S. states. A description of this grid system can be found in the California section of this report in chapter 2. 5 Locating Pesticide Use in California - the MTRS Grid System on page 12.

Since this system has been established for a long time, most farmers know the MTRS coordinates of their fields. Other pesticide users can use various maps to determine the MTRS coordinates. On the reporting forms, only fields for TRS coordinates are given, since the Williamette meridian covers Oregon entirely.[70]

In addition to the standardized forms, a 46 page instruction guide for printed forms, including the coding system, was provided to the participants[71] (see Appendix OR 2). The guide is divided into 4 sections:

- Section 1: Introduction, background of the PUR system
- Section 2: Basics, who must report, and how to report

70 ibid. 68

71 Oregon Department of Agriculture, Pesticides Division (2001): Pesticide Use Reporting System Instruction guide for printed forms, Salem, USA

- Section 3: Forms, how to select the correct form, step-by-step process for completing each form type
- Section 4: Code lists, codes needed to complete many of the required boxes on the form

The coding system developed by ODA is so far partly a numeric system and partly a text format system. It has not been finalised, but site categories and specific sites will be regularly updated on the PUR website.[72] Table 14 presents the code system at this stage.

Table 14: Preliminary Coding System Within Oregons PUR System

Subject	Format	Example (Code-description)
County	numeric, two digits	01-Baker, 36-Yamhill
Equipment, agriculture	numeric, two digits	01-aerosol generator or fogger, 26-wick applicator
Equipment, aquatic	numeric, two digits	04-backpack sprayer, 38-other device
Equipment, boat	numeric, two digits	38-other device
Equipment, forest	numeric, two digits	04-backpack sprayer, 26-wick applicator
Equipment, indoor	numeric, two digits	01-aerosol generator or fogger, 37-wall void injector
Equipment, outdoor	numeric, two digits	01-aerosol generator or fogger, 26-wick applicator
Equipment, right-of-ways	numeric, two digits	04-backpack sprayer, 26-wick applicator
Equipment, vector	numeric, two digits	01-aerosol generator or fogger, 36-sticky board or trap
Equipment, wood	numeric, two digits	38-other device
Site, agriculture— berries	text	blackberries-blackberries, strawberries-strawberries
Site, agriculture—field crops	text	alfalfahay- alfalfa hay, wheat-wheat
Site, agriculture—fisheries	text	fisheries-fisheries
Site, agriculture— fruits	text	apples-apples, watermelon-watermelon
Site, agriculture—livestock poultry	text	cattle beef-cattle (beef), sheep-sheep
Site, agriculture—nursery	text	containernur-container nursery plants out door, greenhouse-greenhouse grown nursery plants
Site, agriculture—nuts	text	hazelnut-hazelnuts, walnuts-walnuts
Site, agriculture—oil crops	text	canola-canola, rapeseedindu-rape seed (industrial)
Site, agriculture—other	text	agstructures-agricultural structures, otherag-other agriculture
Site, agriculture—pasture	text	pasture-pasture
Site, agriculture—rangeland	text	rangeland-rangeland

Table 14: Preliminary Coding System Within Oregons PUR System		
Subject	Format	Example (Code-description)
Site, agriculture—seed crops	text	alfalfaseed-alfalfa (seed), sunflowersee-sunflowers (seed)
Site, agriculture—vegetable	text	asparagus-asparagus, turnips-turnips
Site, aquatic	text	detentionpon-detention pond, waterbody-water body
Site, boat and ship hulls	text	boatshiphul-boat and ship hulls
Site, forestry	text	fedforest-federal forest land, stateforest-state forest land
Site, other (indoor)	text	commercialtr-commercial transportation vehicle and facility indoor, schoolin-school indoor (K-12) and day care facility indoor
Site, other (outdoor)	text	crawlspace-crawl space of dwelling, schoolout-school outdoor (K-12) and day care facility outdoor
Site, right-of-way	text	ditchbanks-ditchbanks (irrigation)
Site, vector/invasive species control	text	invasivespec-invasive species control, vectorcont-vector control
Site, wood treatment facility	text	woodtreat-wood treatment facility

A questionnaire was created to evaluate the pilot program, it contains 10 questions on the handling of the paper forms.

It was estimated that approximately 2,2 to 5,8 million pesticide applications will be reported annually from at least 25.000 reporters in Oregon. Solutions are sought to process this amount of data in a reliable and cost effective way. To achieve this, a request for information was published. This request deals with 3 subjects within the reporting system:

- Data processing of paper form sheets,
- Collection of data from retailers on the type and quantity of household pesticide products sold, and
- Solutions to the development of the computer components of the PUR system

and was addressed to the vendor community.

Private pesticide use in homes and gardens will be estimated by conducting surveys.

72 personal communication with Ms Vogue, Pesticide Use Reporting Coordinator, Oregon Department of Agriculture

5. 3 Access to Reported Information

Reported pesticide use data will not be publicly available in Oregon. Oregon's Administrative Rules states in the Section Access to Reported Information (603-057-0417):

"(1) Some information reported to the Department by pesticide users is prohibited from release to the public according to Oregon Laws 1999, Chapter 1059, Section (8)

(2). Information prohibited from public release includes:

(a) Identity of the owner or lessee of a specific property (except when applications are made by a public agency to publicly owned property); or

(b) The specific location of the property where a pesticide product has been applied (except when applications are made by a public agency to publicly owned property); or

(c) Information which is sufficiently specific that it reveals (a) or (b) of this subsection.

(3) Pesticide use information reported under Oregon Laws 1999, Chapter 1059 may be released to certain persons, provided those persons maintain the confidentiality of any information that is required to be treated as confidential. Persons who may receive this information are limited to the following;

(a) Staff of the Department or other federal or state agency which require the information as part of an investigation conducted under provision of law; or

(b) A federal, state or local agency; or

(c) A health or environmental researcher, acting in an official capacity from an accredited university or accepted research institute.

(4) A federal, state or local agency must agree to maintain the confidentiality of the information identified in subsection (1) of this section, unless the public interest, by clear and convincing evidence, requires disclosure in the particular instance.

(5) Any person that releases, or causes to be released, to the public information made confidential by Oregon Laws 1999, Chapter 1059 may be subject to civil penalty as described in OAR 603-057-0420. The agency, university, or research institute employing or retaining such person or for which such person is acting in an official capacity, may also be subject to civil penalty as described in 603-057-0420.

(6) In addition, if a person causes information identified as confidential to be released or who fails to preserve the confidentiality shall be denied all future access to confidential data collected under 603-057-0410 through 603-057-0416." [73]

The availability of the Oregon PUR data to a limited circle of persons will reduce the utilisation of the data enormously. The prohibition of information on the location (Subsection 2 b-c) will, for example, not allow GIS mapping of applications.

73 Oregon Administrative Rules Related to the Pesticide Use Reporting System, Section 603-057-0417 Access to Reported Information

6 Weaknesses of the Oregon PUR System

Since the system at this time is still in a starting phase, only a few weaknesses are to comment. The weakness of the TRS grid system is the same as mentioned in the Chapter 4 Weaknesses of the California PUR System on page 33. Comments on missing reporting fields relate to the paper reporting forms, since access to the online database was not possible for the author.

Public Access

A major weakness of the Oregon Law on pesticide use reporting is the non-availability of the reported information to the public. California's example shows that pesticide use data are used extensively by a wide range of persons for a broad range of purposes. In Oregon, thorough analyses of the reported data depends on the willingness of ODA.

Agriculture and Forestry

In order to compare pesticide use in amounts, application frequency and environmental impacts of information on different farming practices such as cultivation of genetically modified crops, organic farming, tillage vs. non-tillage farming and crop rotation vs. no-crop rotation are needed. For this purpose several data fields and/or site codes are missing on the existing form and/or within the coding system. Other field/site specific information are missing to evaluate collected data, currently there is for example only the treated acreage asked.

There is yet no coding for forestland.

General Site (all) and Vector/ Invasive Species Control Areas

There is no data field for the treated acres (golf courses, and recreation areas) and there is no data field for the estimated volume of treated rooms (all building, vehicles).

Epidemiological studies on the effects of pesticides are often very complicated due to missing exposure data. For applications in residential homes and gardens, the family name and the age of the inhabitants should be recorded. Those data could be handled confidential to the public, but open to public health researchers.

Table 15 presents problems and possible solutions.

Table 15: Weaknesses of the Oregon PUR system and Possible Solutions

Problem	Solution 1	Solution 2
No public access to the reported data	change of administrative rules	
Not possible to identify genetically modified crops	separate site codes for genetically modified crops	check box behind the site code: Genetically modified (Y/N)
Not possible to identify organically crops	separate site codes for organically crops	check box behind the site code: Organically grown (Y/N)
Not possible to identify tillage vs. non-tillage farmers	check box behind the site code: Tillage (Y/N)	
Not possible to identify crop rotation practices	check box behind the site code: Crop Rotation: 0 1 2 3 4 5 6... (circle one)	

Table 15: Weaknesses of the Oregon PUR system and Possible Solutions		
Problem	Solution 1	Solution 2
Missing specific information on the treated field, site	field ID number (to be created by the reporter, unique in combination with the reporter ID)	
	additional field: total size of the field	
	additional field: planted acreage (in case one field is cultivated with more than one crop, the reporter should treat each crop area field as a separate field and assign another field ID	
Missing information on forest land	site codes for different forest ages	
Missing information general sites	additional field: treated area	
	additional field: estimated room volume	
	additional field: family name	
	additional fields: age of the inhabitant	
Missing information vector/ invasive species control	additional field: family name	
	additional fields: age of the inhabitant	

7 Summary

The two pesticide use reporting systems presented in this report are so-called full reporting systems. Both are comprehensive and detailed, all agricultural use and most commercial non-agricultural use has to be reported by the applicator. In California a separate form for use reporting in schools is now in use.

California PUR data are publicly available and serve a wide range of purposes. The data have been used for research, evaluation and the observation of trends. The California Department of Pesticide Regulation continuously improves the PUR system to make it more efficient. There are still some major additional needs and weaknesses, especially for the reporting of non-agricultural use.

With signing House Bill 3602 in 1999, Oregon also initiated a full pesticide use reporting system. This Oregon PUR system, which started in January 2002, presents a unique opportunity to obtain useful information on the use of pesticides per active ingredient, crop, location and date to protect human health and the environment. It is also an example for other states and countries, that the establishment of a full reporting system can be done in a few years, with relatively little resources. A major weakness of the Oregon PUR system is the limited access to the reported information. This limits data utilisation to protect human health and the environment.

The PUR systems in California and Oregon differ considerably in the procedure of reporting. In California most reports are send as hard copies to the County Agricultural Commissioners, which enter the data and do a first validity check. In Oregon, reporting is completely electronic, the pesticide use logs in a Internet based database and reports directly to ODA.

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Appendices are only available at the PAN Germany website:

www.pan-germany.org